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A CLINICAL STUDY OF BRONCHIECTASIS IN CHILDREN

- by -

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- for -

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I N T R O D U C T I O N.

The following work constitutes a Clinical study of Bronchiectasis, with special reference to Children. The work is divided into three main sections. Firstly, a general description of the subject is given; then a series of 20 cases (in /2 of which a diagnosis of Bronchiectasis was made), personally observed and investigated by the writer, are described; and finally, a summary with conclusions is appended.

The cases were collected by the writer during a six months' period of residence in a voluntary hospital for infants and children. The hospital contained 110 beds, about half of these being occupied by medical cases, and the majority of cases were first seen in the out-patient department and later admitted for observation and investigation.

S C H E M E.

SECTION I.

Description of Condition under following headings :-

1. Definition.
2. History.
3. Incidence: Age. Sex.
4. Aetiology.
5. Pathology.
6. Clinical Features.
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8. Prognosis and Course.
9. Treatment: Prophylaxis. Medical. Surgical.

SECTION II.

Notes on 20 Cases.

(including 12 cases of Bronchiectasis).

SECTION III.

General Summary with Conclusions.

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S E C T I O N I.

BRONCHIECTASIS: GENERAL DESCRIPTION.

Definition.

Beaumont[2] simply defines the condition as "Dilatation of the Bronchi", and no further explanation is necessary.

Historical.

The condition was first described by Laennec[23] in 1826; in his "De L'Auscultation Mediate" he described four cases (three of which began in childhood), and it is interesting to note that McNeil, Macgregor and Alexander, in the fourth of a series of articles on pneumonia in childhood[28], which is chiefly devoted to bronchiectasis, say, "His (Laennec's) account of the subject is not only important historically. It is useful, sound and accurate".

The next important account of the condition was given by Corrigan[10] in the "Dublin Medical Journal" in 1838, when he wrote on "Cirrhosis of the Lung", and described four cases of bronchiectasis. His work is chiefly concerned with the relationship of pulmonary fibrosis to bronchiectasis.

In 1891, Clark, Hadley and Chaplin[8] published some

work, also on pulmonary fibrosis, in which they described 45 cases of bronchiectasis. In all these cases, tuberculosis was excluded.

Another interesting publication of a series of cases (33 in number) was made by Riviere[40] in 1905. All his cases were in children, and 23 of them occurred in children under five. This work is important because it emphasises the connection of bronchiectasis with measles and whooping-cough and the associated conditions of bronchitis and broncho-pneumonia.

It was not, however, until 1921, when Siccard and Forrestier introduced lipiodol for radiological examination of the lungs, that progress began in the knowledge of the condition. Hitherto, accurate diagnosis had been impossible. Still later, the development of thoracic surgery and its possibilities in the treatment of bronchiectasis has led to further interest in the subject.

Incidence.

Since the introduction of lipiodol, and consequently the more frequent and more definite diagnosis of bronchiectasis, it has been realised that the condition is much more common than was previously thought. Oschner[33] goes as far as to say it is one of the most frequently encountered of pulmonary affections, and even commoner than pulmonary tuberculosis.

McNeil[26] encountered eight cases of bronchiectasis in 1,000 general medical cases.

Moll[29] quotes the following figures for the incidence of the disease :-

1. Out of 12,225 post-mortems performed at Leeds General Infirmary from 1912 to 1932, only 50 cases of bronchiectasis were found (i.e. ·4%).
   N.B. These were cases of "primary" or "idiopathic" bronchiectasis and not cases due to obstruction by foreign bodies, carcinoma, tuberculosis, etc.
2. Willigh (Oschner) found bronchiectasis in 8% of 4,547 post-mortems.
3. Biermer found bronchiectasis in 2% of 400 post-mortems.

Formerly, many cases of bronchiectasis were diagnosed as tuberculosis and even admitted to sanatoria.

Age Incidence.

As will be seen later when the aetiology is discussed, it is generally considered that bronchiectasis (apart from those cases due to obstruction by foreign body, carcinoma, etc.) usually originates from an acute attack of bronchitis or pneumonia, especially after measles and whooping-cough; it follows that the maximum age of inset will probably be in childhood, since these are essentially diseases of childhood. Moll[29] says that in 50% of his series of sixty cases, the disease began during the first five years of life. Clark, Hadley and Chaplin[8] observed that 82% of a series of 45 cases had their origin before

the age of eight.

Sex Incidence.

This may be taken to be about equal in both sexes. In Findlay's[16] series of 23 cases, ten were boys and thirteen girls. Wall and Hoyle[47] report seven males and thirteen females in twenty cases.

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Aetiology.

Many observers, e.g. Moll[29], divide the cases into primary, or "idiopathic", and secondary. By secondary cases they mean those that follow partial obstruction of a bronchus. Complete obstruction of a bronchus causes collapse of the area supplied in twenty-four hours. If, however, there is partial obstruction of a bronchus the area behind this becomes the seat of bronchiectasis. The chief causes of such a partial obstruction are :- (1) aspiration of foreign bodies; (2) carcinoma; (3) stricture (e.g. from a syphilitic ulcer); (4) pressure from outside (e.g. by a tuberculous gland or focus or by an aneurysm).

The so-called secondary cases probably form a minority, especially during childhood, and most cases are probably of the type described as primary or idiopathic. There are many theories as to the cause and mode of onset of this type, but it now seems to be fairly generally agreed that inflammation of the bronchial wall, such as occurs after acute bronchitis and pneumonia (especially broncho-pneumonia), particularly when these follow measles or whooping-cough, is the chief aetiological factor.

The Inflammatory Theory. McNeil, Macgregor and Alexander[28] have made a special histological study of the subject. In a series of post-mortems made on cases of broncho-pneumonia, they found bronchiectasis in varying stages, and were able to trace the process in great detail. In the earlier cases they found a

severe ulcerative form of bronchitis which had destroyed the walls to a varying degree in different places. The lumen was enlarged and filled with pus, the epithelium and muscle destroyed, and in many cases the cartilage was also destroyed so that cavities were formed which were bounded by lung tissue. In these early cases there was no fibrous tissue nor attempt at healing, but cases seen at a later stage showed the cavities becoming filled with granulation tissue, and still later, the epithelium from other parts of the bronchi was seen to be growing over these granulations. In the advanced cases this granulation tissue had become transformed into dense fibrous tissue, and therefore the bronchial walls in the affected parts became entirely composed of fibrous tissue, lined by epithelium, and the usual component parts, such as muscle and cartilage, had entirely disappeared. Furthermore, it was found in these advanced cases that the fibrous tissue which formed these new bronchial walls was invading the lung tissue, for a proliferation of fibro-blasts was seen in the walls of the alveoli which surrounded the affected bronchi. In the most advanced cases, a condition of chronic interstitial pneumonia was found, i.e., dense fibrous tissue was present in the lung substance; it is interesting to note that these observers point out that there was no evidence of this scar tissue having pulled on the bronchial walls and stretched them. In fact, they say that the walls of the dilated bronchi were often actually thrown into folds.

McNeil, Macgregor and Alexander, in a previous article in the same series[27], in which they emphasise the comparative

frequency in infancy of lobar pneumonia as contrasted to broncho-pneumonia, point out that it is chiefly after broncho-pneumonia that bronchiectasis occurs, because here, there is inflammation of the bronchi with consequent destruction, whereas in lobar pneumonia (or alveolar pneumonia, as they prefer to call it) the inflammation is chiefly in the alveoli and the bronchi are but little affected, and therefore not so liable to develop bronchiectasis. If bronchiectasis does occur after lobar pneumonia, it is probably more frequent in the influenzal type or the less virulent forms, e.g., those due to pneumococci of type IV.

It appears, then, that inflammation and destruction of the bronchial wall are essential, in the first place, for the production of bronchiectasis. There are many other theories regarding the cause, but most observers, including Moll[29], hold this view. Moll alludes to an analogous condition which has been shown by lipiodol to exist in the parotid gland, in which the ducts become dilated following inflammation. He also states that most cases of bronchiectasis are probably preceded by a functional dilatation of the wall which in some cases may proceed no further and may clear up. McNeil, Macgregor and Alexander[28] also mention this condition, which they call <u>acute bronchiectasis</u> and compare with the analogous condition in the alveoli, of emphysema, which often occurs at the same time. Others, e.g. Robinson, describe it. This temporary dilatation may be due to

loss of muscle tone. Moll[29] quotes Hudson's experiments, in which he took a rapid series of X-ray photographs after lipiodol had been given, and found in the normal chest that the bronchi (1) become wider and elongate during inspiration and (2) become narrower and shorter during expiration, and that this appearance was not found in bronchiectatic areas. It has also been shown that the peristalsis which is present in the normal bronchi is absent in bronchiectasis. Boyd[5] says, "In these early cases of bronchiectasis shown by means of lipiodol, there may be little anatomical change in the walls of the bronchi. The dilatation appears to be due rather to atony of the bronchial musculature, the result of bacterial toxins, and may completely disappear after appropriate treatment". Findlay[17] quotes three cases in which dilatation of the bronchi was shown by lipiodol to exist, and in which the dilatation was shown by subsequent lipiodol examination to have disappeared. These were evidently cases of the functional variety, but it is evident that once there is destruction of the wall, the chronic form must ensue.

The history of antecedent pulmonary disease which is so common in bronchiectasis also lends support to this inflammatory theory. Findlay and Delille[15], in a series of 25 cases in children, found that there was a history of previous respiratory disease in all but three.

With regard to the inflammatory theory, it must be pointed out that bronchiectasis is very often associated with

inflammatory disease in the upper air passages and often occurs after operations in these regions. This is probably due to aspiration of septic material into the lungs, although some writers suggest that the bronchiectasis is the primary condition and that infection of the upper air passages (e.g. nasal sinusitis) is secondary and is due to infection from the sputum expectorated.

It has been found that the sputum in many cases of bronchiectasis contains spirochetes and fusiform bacilli, and it has been suggested by some that bronchiectasis may be a condition in which there is a specific infection by these organisms; they compare the condition with that of an arterial aneurysm where there is a weakening of the wall by spirochetes. There does not seem to be much support for this theory. Robinson[42] examined the lungs in sixteen cases of lobectomy performed for bronchiectasis, but did not find any uniform bacterial flora. Spirochetes were only found in four of the cases. Robinson's investigation is interesting in many ways, but chiefly because it lends much support to the infective, or inflammatory, theory. While describing the process, Robinson says a striking feature was the presence of definite intimal thickening (and consequent stenosis) of the peri-bronchial arteries. This he found in 65% of his cases and, although he doubts of its importance as a prime factor, he certainly thinks it may be a contributory factor, and suggests that this partial arterial occlusion may

lead to nutritional changes which weaken the wall. He quotes Sauerbruch and Brunn, who tied some branches of the pulmonary artery in animals and produced fibrosis, which subsequently led to bronchiectasis.

The Fibrous Traction Theory. So frequently is bronchiectasis associated with pulmonary fibrosis that these two conditions may in a sense be said to be synonymous, and in many text-books (e.g. "Diseases of Infancy and Childhood", by Parsons and Barling) the two conditions are described together under the one heading. Some observers maintain that this fibrosis is the chief factor in the production of bronchiectasis, and that the mechanism of its production is by traction on the walls of the bronchi by the contracting fibrous tissue. Corrigan[10] was the chief exponent of this theory, but his supporters are now probably few, although most observers suggest that this mechanism may be a minor factor in the production of bronchiectasis. Corrigan also said that loss of the supporting tissue of the bronchi, resulting from fibrosis, was part of the cause.

The work of McNeil, Macgregor and Alexander (see above) suggests that it is probably not an aetiological factor at all; they show that fibrosis is the result of, rather than the cause of, bronchiectasis. Moll[29] regards fibrosis as an "unimportant factor" and says that not all cases of bronchiectasis are associated with fibrosis (c.f. the early cases described by

McNeil, Macgregor and Alexander). Again, in that form of fibrosis of the lung due to inhalation of dust (the pneumoconioses) bronchiectasis does not seem to occur, which shows that fibrosis can occur without bronchiectasis.

Others have stressed the importance of pleural adhesions as causing traction on the bronchi resulting in dilatation.

Increased Intra-Bronchial Pressure. Although most observers agree that this is a factor in the production of bronchiectasis, there is considerable difference of opinion regarding the degree of importance that should be attached to this factor. Moll[29] thinks it is a minor factor, and the work of McNeil, Macgregor and Alexander also suggests this. Some say that the mechanism of its production is by forcible expiration, especially when the glottis is closed, and others that it is due to deep inspiration. Both these may occur in severe and spasmodic coughing, such as occurs in pertussis. Some cases of bronchiectasis certainly seem to originate in uncomplicated cases of pertussis, yet even in these cases there is probably always a certain amount of bronchial inflammation also, which is not severe and escapes notice. Cough is probably better considered as the result of, rather than the cause of, bronchiectasis. Others, again, suggest that the dilatation is caused by distension of the tubes with secretion, but how does this explain the so-called dry cases, i.e., where there has never been any sputum or moist sounds?

Congenital Pre-Disposition and Congenital Form. Apart from the recognised congenital type of bronchiectasis, it has been suggested by some (e.g. Suerbruch) that even in the acquired cases there may be a congenital element of weakness. The theories of the cause of the actual congenital varieties are various and confusing. A good description of a case of congenital bronchiectasis is given by Morlock and Pinchin[30]. Other cases have been described by Collins[9] and by Wood[50]; and Koontz[22], in a series of 108 cases of congenital cystic lung which he collected from the literature, found many cases of congenital bronchiectasis.

Atelectasis and Bronchiectasis. It has been shown that, if a portion of a lung collapses, bronchiectasis develops in this. Anspach[1], after describing a series of cases, says, "Atelectasis precedes and plays a prominent and most constant role in the development of a common form of bronchiectasis of the lower lobe". He says that if no drainage occurred from the collapsed lobe, bronchiectasis developed within a period of months or years, but that, if the atelectasis cleared after drainage, bronchiectasis was unlikely to develop. He does not claim, however, that all cases are produced in this way. Warner[48] says that 6% of all cases of bronchiectasis show atelectasis (as shown by X-ray examination). The mechanism he describes is that the deflated alveoli cause a negative pressure outside the bronchi which consequently dilate. He also describes five cases of

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~~bronchiectasis~~ of a whole lung which he says were associated with bronchiectasis. Moll says that the atelectatic form is usually due to imperfect clearing after pneumonia.

Summary of Aetiology. There appears to be a congenital form of bronchiectasis, but this is rare. Most cases are, therefore, acquired. Some (but these are a fairly small minority) are due to bronchial obstruction. The majority of cases are due to previous acute respiratory disease (whether this is a primary disease or secondary to such illnesses as measles, whooping-cough influenza, etc.), and the mechanism of production appears to be by destruction of the bronchial wall and replacement by fibrous tissue, while other factors, such as increased intra-bronchial pressure and surrounding atelectasis, may contribute.

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Pathology.

Various pathological types are described. Most observers define two types - (1) a tubular (or cylindrical); (2) a saccular. Moll[29], however, divides cases into four pathological types, as follows :-

1. Uniform, tubular, or cylindrical. Here the ramifications of the bronchi retain the size of the larger divisions.
2. Fusiform, or "glove-finger". This appears to be most common in the forms associated with atelectasis.
3. Globular or sacculated. This is the most extreme form and probably the most common form. It is usually associated with fibrosis of the lung.
4. Moniliform, or "bead-like". Here there are minute bead-like dilatations on the bronchi.

Moll gives the incidence of the various types in 32 cases, viz :-

Tubular	7
Marked Saccular ...	9
Early Saccular ...	5
Fusiform	4
Moniliform ...	2
Intermediate ...	5
Total	32

Distribution. It seems probable that most cases are ~~probably~~ unilateral at first and later become bilateral. Thus figures differ according to whether they are taken from early or late cases, e.g. Moll gives the following figures :-

	55 Post-Mortems	37 Lipiodols
Unilateral ...	50·9%	67·5%
Bilateral ...	49·1%	32·5%

Hedblom[19] says that in 70% of 63 cases which he investigated with lipiodol, the disease was unilateral. Again, Lebert, quoted by Fox[18], found 28 unilateral cases in 54 cases examined post-mortem, and West says Trojanowski found 35 unilateral cases in 74 post-mortems. Findlay and Delille[15], reviewing 25 cases in children, found that 80% were unilateral.

The Sides. Most people agree that the left side is more commonly affected than the right; some even say it is twice as common in the left lung. Wall and Hoyle[47] found nine left basal cases and five right basal cases in fourteen unilateral cases. Various theories have been brought forward to explain this; the usual explanation is that the left bronchus comes off at a more acute angle than the right, and therefore drainage is more easy on the right.

The Lobes. The lower lobes are undoubtedly more often the seat of bronchiectasis.than the upper ones - in fact, it is rare to find bronchiectasis in the upper lobes only, and especially the left upper lobe. Here are Moll's figures in 53 unilateral cases :-

Upper lobe ...	7	or 13·2%
Middle " ...	3	" 5·6%
Lower " ...	30	" 56·6%
Diffuse ...	13	" 24·6%

The reason for the more common appearance in the lower lobes is that efficient drainage is not possible to the same extent in the lower lobes as it is in the upper.

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CLINICAL FEATURES.

Previous History. The most outstanding clinical feature of bronchiectasis is the almost constant history of previous acute respiratory disease. Usually, this is bronchitis, broncho-pneumonia, or lobar pneumonia, often seen as a complication to measles, whooping-cough or influenza. In some cases only a history of uncomplicated measles, whooping-cough or influenza may be obtained. The acute respiratory infection may date to some years previous. In many cases there is a history of recurrent acute respiratory disease; in some there is a history of aspiration of a foreign body, and in others of an operation on the upper air passages.

Wall and Hoyle[47], writing on the "dry" variety of bronchiectasis, say that the three commonest causes are pertussis, measles, and broncho-pneumonia. In their twenty cases only three did not give a history of one or other of these.

A history of acute pulmonary disease was traced in all but three of 23 cases described by Findlay and Graham[16], viz :-

Broncho-Pneumonia	8 cases
Lobar "	2 "
Pleurisy	2 "
Bronchitis	1 case
Measles	1 "
Measles & Broncho-Pneumonia..	1 "
Influenza	1 "
Pertussis	2 cases
Pertussis & Broncho-Pneumonia	1 case
Measles and Pertussis ...	1 "
Total ...	20 cases

The following figures are given by Moll[29] :-

Mode of Onset	Diagnosed by Lipiodol	Diagnosed at Autopsy	Total
Pneumonia	19	8	27
Pertussis	4	2	6
Bronchitis	2	12	14
Influenza	1	-	1
Abscess	1	-	1
Empyema	1	-	1
Foreign Body	-	2	2
Gassing	-	2	2
Acute	-	3	3
Congenital	-	1	1
Insidious	3	4	7

There may be a history of cough since the original illness, or there may be no symptoms till after an acute respiratory illness has recurred a few times.

The Subject. The subject does not belong to any special clinical type. Pearson and Wyllie[36] say that "chronic bronchitis" is seen in all types of children but particularly the "lymphatic" type, and this probably also applies to bronchiectasis.

Except in advanced cases, the general health is usually fairly good, and patients may live for years with little

or no inconvenience. The patient may be somewhat under weight, but there is not the same tendency to wasting as there is, for example, in tuberculosis or other chronic infections, although, of course, wasting may be marked in an advanced case. Similarly, there is little evidence of toxaemia in comparison with other chronic infective states. Children who are the subjects of bronchiectasis are, however, usually rather stunted in growth; they tend, in fact, to be comparatively small in stature for their weight. Findlay and Graham[16], in particular, have stressed this, and in their series of 23 cases the average height was 7·8 cms. under the normal (Holt's standard), whereas the weight was usually only slightly below normal.

The general muscle tone is usually fairly good, and the patients do not tend to suffer from lassitude to the extent that one might expect, except in advanced cases.

The appetite may be poor, but again not to the same extent as, for example, in tuberculosis, and many subjects have good appetites.

The temperature is usually not elevated, except during the attacks of acute inflammation (e.g. bronchitis and pneumonia) which are so common, and sweating is not a marked feature.

Symptoms and Signs. Findlay quotes Delille[12] as saying there are some cases with symptoms and no signs, and some with signs and no symptoms, while others have neither symptoms nor signs.

There is no symptom, nor is there any group of symptoms, which can be said to be diagnostic of the disease.

Cough. This is one of the most important symptoms and it is often for this symptom that the patient is first brought for advice. Cough may be slight or absent, but in the majority of cases it is a pronounced feature. Wall and Hoyle[47] report that in twenty cases they observed, there was cough in all but three. Findlay and Graham[16] found cough in 22 out of their 23 cases.

There may be a constant irritating cough. Usually, however, there are paroxysmal attacks of coughing which are frequently accompanied by the production of sputum. Such attacks occur chiefly when there is any alteration of position - e.g. on awakening in the morning. They may waken the patient at night. Often they are accompanied by vomiting.

Sputum. This is usually a definite feature; yet in some well-marked cases of bronchiectasis there may be no sputum, i.e. in the so-called dry cases. In the twenty cases of Wall and Hoyle[47] referred to above, which were cases of the dry type, sputum was completely absent in nine, and even in the rest was only slight and never foetid. Of the 23 cases of Findlay and Graham[16], most had sputum; only four had none (even on postural drainage), and one had sputum only after posturing. These observers also noticed that cases of over 1½ years' duration almost invariably

had sputum.

In the classical cases there is abundant sputum (even as much as a pint in 24 hours), and this is usually expectorated during the paroxysmal attacks of coughing. It may be mucoid, or muco-purulent, and in the advanced cases even purulent. Often it has a very offensive odour, and the detection of this odour in the patient's breath has been said by some to be diagnostic of the disease. When allowed to stand it often separates into three layers, viz :- (1) an upper frothy layer, (2) a middle turbid layer, (3) a lower layer of turbulent deposit. It often contains spirochetes and fusiform bacilli.

Haemoptysis. Sometimes this is the only symptom. A clinical variety of the disease exists, known as Haemorrhagic Dry Bronchiectasis. Bezancon and Azoulay[4], in 1924, were the first to describe this. In 1930, Pinchin and Morlock[38] wrote on nine cases in which there was recurrent haemoptysis in each case. In many of these cases abnormal physical signs on the chest were slight or absent. It was pointed out that the haemoptysis was often copious and even more so than in a case of pulmonary tuberculosis. Wall and Hoyle[47] described a series of twenty cases of "Dry Bronchiectasis" and stated that haemoptysis was only found in five of these.

Dyspnoea is not a common symptom, except in the advanced cases, and many patients are able to take a normal amount of exercise without much discomfort.

Cyanosis is usually only seen in advanced cases.

Finger Clubbing. This is a very important sign, and occurs in a large number of cases. It is most frequent in the severe cases, but is also quite frequently seen in cases with little or no abnormality in physical signs. Pinchin and Morlock[38] regard clubbing in bronchiectasis as being due to toxic absorption and say that it is not found in the dry cases or in apical cases where there is better drainage. Findlay and Graham[16] in their series of 23 cases, had eleven cases of clubbing.

The Chest - Physical Signs. As already stated, cases may be encountered with little or no physical signs even although well-marked dilatation has been shown by lipiodol to exist. In most cases, however, some abnormal physical signs can be detected and often these are marked.

Inspection may show no abnormality. In unilateral cases, especially where there is much associated fibrosis, there may be some flattening on the affected side, and diminished movement.

Palpation. The diminished movement may be confirmed by palpation. Sometimes rhonchial fremitus may be elicited. Vocal fremitus is often diminished, especially in cases with much fibrosis. Occasionally it is increased.

Percussion. There is often no alteration in the percussion note

but in many cases impairment is found over the affected area, and there may even be marked dullness.

Auscultation. No abnormality may be detected with the stethoscope. In many cases, however, there are signs of diminished air entry, the breath sounds being faint and distant over the affected area. In other cases the breath sounds are loud and of a bronchial type, and even amphoric breathing may be detected if there are large cavities. The vocal resonance varies, e.g. it may be diminished if the element of fibrosis is marked, but when there is extensive cavitation it is increased, and bronchophony and even whispering pectoriloquy may be heard. In most cases there are accompaniments; these may be loud bubbling râles or merely harsh rhonchial sounds.

A feature of the physical signs is their tendency to sudden complete alteration, e.g. if the cavities are full the breath sounds are faint and there is considerable dullness, but when the cavities are emptied after a spasm of coughing the signs change and loud bronchial sounds are heard.

It is not always possible accurately to locate the site of the disease by the physical signs, as has been shown by bronchography. Sometimes bilateral sounds may be heard in unilateral disease and vice-versa.

Physical signs were present in all but two of the twenty cases of Wall and Hoyle[47]. They were found as follows :-

Dullness	17
Weak breath sounds ...	13
Crepitations	13
Bronchial breath sounds ..	4
Friction	1
Signs of cavity	1

All these signs were basal, and only in three cases did they fail to locate the site by the signs, without lipiodol examination.

X-Ray Appearances. A plain X-ray photograph may give no indication of the presence of bronchiectasis. Often, however, especially where there is much fibrosis, some increased density may be seen in the bronchiectatic area, or the dilated bronchi themselves may throw faint shadows.

Roles and Todd[43] point out that fixation of the diaphragm, seen on screening, is an early and important sign of bronchiectasis.

The association of atelectasis with bronchiectasis has been mentioned already. Warner[48] has described some cases of bronchiectasis which he says were associated with massive atelectasis over a whole lung. He describes the appearances on a plain skiagram as being that of whorl-like shadows seen evenly scattered over a whole lung, and contrasts this appearance with the more irregularly distributed shadows seen in bronchiectasis associated with fibrosis.

A more generally recognised condition is the presence of bronchiectasis associated with atelectasis of a whole lobe.

In this condition a triangular shadow[37] is observed at one or other base. It may be fairly small and dense, or large and less dense, according to whether the collapse is complete or incomplete respectively. Sometimes the shadow is hidden behind that of the heart and easily escapes notice. It represents a right-angled triangle, one side corresponding to the vertebral column, another to the diaphragm (the angle between these two being the right angle), and the third being the hypotenuse. It is usually found that the mediastinal shadow is pulled over to the same side. Anspach[1] has shown that these triangular shadows represent collapsed lobes, and has noticed how they may vary in density and eventually may disappear entirely. He has also shown that they are frequently the site of bronchiectasis, although not always so.

Bronchography. A method is now available of obtaining a definite clinical diagnosis of bronchiectasis. This consists in injecting opaque substances which will outline the bronchial tree. After many attempts with barium and bismuth and other substances by various workers, Siccard and Forrestier eventually, in 1922, introduced the use of lipiodol. This is still the most universally used substance. It consists of 40% iodine in poppy-seed oil. It is a clear, amber-coloured, viscid fluid. Other similar substances are (1) "Iodipin"

(a German preparation); (2) "Iodumbrin" (a Danish preparation). These are said to be less viscid, but their iodine content is less than that of lipiodol, and they do not give such clear pictures. "Neo-Hydriol" is another preparation (British) which is said to contain 40% iodine, and which has a low viscosity and gives clear pictures. If there is any possibility of iodine idiosyncrasy, Crochet[11] advises the use of "Bromipin" or "Contrasol" which are preparations of bromine and oil.

Lipiodol has greatly facilitated the diagnosis of bronchiectasis and enabled the physician to define the extent of the disease with accuracy. Boyd[5] says, "It has been the custom to regard bronchiectasis as a rare condition. ..... The use of lipiodol has shown that in milder degree bronchiectasis is a very common condition".

Technique of Administration. Various methods of introducing the lipiodol are in use.

(1) The Supraglottic Method. After the fauces and larynx have been anaesthetised with cocain, the tongue is pulled forward and the lipiodol is injected over the back of the tongue so that it trickles into the larynx. The injection is made through a syringe attached to a rubber or gum elastic catheter. Some inject the lipiodol in a similar way by means of an intra-nasal catheter.

(2) The Intra-Laryngeal Method. In this method an endoscope

is passed into the larynx (usually under general anaesthesia) and the lipiodol is injected through this by means of a catheter and syringe. This is not a very suitable method in young children as considerable experience is necessary in inserting the endoscope.

(3) Intra-Tracheal Injection. Probably the most commonly adopted procedure is to inject the oil directly into the trachea, either through the crico-thyroid membrane, or in the sub-cricoid region. This is the most convenient and satisfactory method for children. It may be done under local anesthesia, but in younger children general anaesthesia is advisable. Special canulas (with trocars) adapted to fit the syringe are available, as it is difficult to inject lipiodol through an ordinary needle, even of large bore.

(4) A bronchoscope may be passed and the material injected through this. In younger children this is not without difficulty.

By whatever method is used, it is possible to outline the bronchi on both sides at once. The patient is kept in the upright position while the injection is being made, and is tilted to one or other side according to which side it is desired to outline. If a picture of both sides is desired, as is usually the case, the patient may be turned on to the other side when half of the quantity of lipiodol has been injected into the one side. The X-ray photograph should be

taken preferably with the patient in the upright position, as in this way the cavities may be shown up more clearly by the fluid level[21]. If it is desired to outline the bronchi in the upper lobes, it is necessary to have the patient in the horizontal position for a short time before taking the picture. It is said that lipiodol has a greater affinity for the bronchiectacic parts of the lung.

When the subsequent photograph is examined it should show an outline of the trachea and main bronchi, with their ramifications gradually tapering away like the branches of a tree, and also patches of lipiodol in the alveoli. If there is any bronchiectasis, the dilated areas should be shown up according to their type. If the dilated tubes are filled with secretion the lipiodol fails to enter, and thus the condition may be missed. If there is much secretion it is better to have the cavities drained immediately beforehand by postural coughing.

Fenton[13] has devised a special apparatus by which he anaesthetises the larynx and injects the lipiodol by compressed air.

Dose and Effects. The recommended dose varies from about 20 - 40 c.c. in an adult. Most people advise about 10 - 20 c.c. in a child. Beaumont and Dodds[3] say that 8 - 10 c.c. is sufficient for children of 7 to 14. Findlay and Graham[16] say they have injected as much as 25 c.c. in infants of one

year.

Usually no toxic effects are obtained, but it is advisable not to use the lipiodol if it is dark in colour. Owing to its high iodine content, symptoms of iodism may be obtained. Some workers advise the administration of iodides (e.g. Pot. Iod. gr. X t.d.s.) for one day before, to find if there is any idiosyncrasy to iodine. This usually manifests itself by increased salivation, rhinorrhoea, vomiting, diarrhoea, faintness and giddiness, etc. Two cases[44] have recently been reported in which severe symptoms of acute iodism developed, following the injection of lipiodol for bronchography. One of these proved fatal. The other recovered after intravenous hypertonic salines had been given. The possibility of the symptoms being due to the poppy-seed oil fraction of the material was suggested. Carmichael[6] has also reported two similar cases.

Toxic symptoms are more likely to ensue if the lipiodol reaches the stomach, as it is thought by some that it is absorbed more quickly from the stomach. The lipiodol is excreted chiefly by the urine and by the sputum and saliva. After 24 hours a considerable quantity has usually been coughed up, but about two-thirds usually remains for one week and traces may be found in the lungs months later.

Before using lipiodol, pulmonary tuberculosis should be excluded, because it is stated that, if there is any

attempt at fibrous healing of the lesion, this may be destroyed by the iodine content of the lipiodol. On the other hand, lipiodol usually has a beneficial effect on cases of bronchiectasis.

The possibility of sub-cutaneous emphysema developing after injection through the crico-thyroid membrane has been mentioned by Siccard and Forrestier[45].

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D I A G N O S I S.

The use of lipiodol has enabled a definite diagnogis to be made in every case. Before lipiodol was discovered, there must have been considerable difficulty in arriving at a diagnosis in many cases. Indeed, it is often stated that many cases of bronchiectasis have been attending, or even resident, in Sanatoria as tuberculosis suspects. The tuberculous subject, however, usually shows more evidence of wasting and toxaemia, and tuberculous lesions in the lungs tend to affect the apex chiefly, whereas bronchiectasis is more common at the base, and, of course, tubercle bacilli may be detected in the sputum in pulmonary tuberculosis. Lipiodol will settle the diagnosis, although it should be noted that the two conditions may (although rarely) co-exist.

Many cases of chronic bronchitis or asthma may be found to be cases of bronchiectasis if investigated with lipiodol. Other conditions which may be confused with bronchiectasis are, an inter-lobular empyema, lung abscess, or lung tumour. In these conditions there is usually cough and sputum (often abundant), and the physical signs may resemble those of bronchiectasis, but a lipiodol examination will decide the diagnosis.

A diagnosis of fibrosis of the lung should always

suggest the possibility of bronchiectasis also, and the finding of a triangular basal shadow by ordinary radiography is an indication for further examination with lipiodol, owing to the frequent association of bronchiectasis with this condition.

In general, a history of chronic cough, with or without sputum, and of previous acute respiratory trouble, should always arouse the suspicion of bronchiectasis. A provisional diagnosis may be made from the finding of finger clubbing, and some impaired resonance and moist sounds localised at one base, but a definite diagnosis can only be made after bronchography.

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PROGNOSIS AND COURSE.

This aspect of the subject gives rise to much controversy. Some, without reservation, say the prognosis is grave. Others say that the condition is compatible with long life: in a well-known case reported by Laennec, a woman (a pianoforte teacher) had a cough and spit and frequent attacks of haemoptysis since childhood, yet her general health was good and she died at the age of 72 of "old age", but at autopsy definite bronchiectasis was found in the right upper lobe and slightly in the left upper lobe. Beaumont[2] says the prognosis is grave "unless adequate treatment is obtained early". Taylor[46] says the prognosis is good in comparison with pulmonary tuberculosis.

Most observers agree that the condition is progressive and that it usually commences in childhood[14]. It appears, however, that in slight cases complete recovery may be made. Findlay and Graham[17] describe three cases in which slight bronchiectasis was found by lipiodol, but in which subsequent bronchography showed that the condition had disappeared. In these cases the average duration of the condition was 3-4 years. The writers add that they do not agree with Hutinel when he says that the earlier the condition occurs the more likely is recovery. McNeil, Macgregor and Alexander[28] point out that when there is

destruction of the bronchial wall a chronic bronchiectasis ensues, but they also mention a form which they call acute bronchiectasis, in which there is a temporary dilatation which is recovered from. Wall and Hoyle[47] also mention the possibility of recovery in cases of dry bronchiectasis.

Findlay and Graham[17] on the whole tend to regard the prognosis as grave. They also emphasise the fact that the duration of the illness is of no prognostic help. In another article[16] they point out that bronchiectasis is chiefly found in children, partly because it usually originates in infancy and partly because the subjects do not live to adult life; they quote Clark's cases (45) in which 60% were under twenty years of age, and the average duration of the condition was eleven years. McNeil[26] says in his experience most deaths occur under two years. Roles and Todd[43] followed 106 "established" cases (not severe) for periods varying from three to six years and found a mortality of 38% in these at the end of that time. They also found that there was a mortality of 55% in cylindrical cases as opposed to 24% in saccular cases, and that the mortality of medically treated cases was 51% as compared with 30% for those treated surgically.

Since thoracic surgery is still in its infancy, it may be hoped that the operation mortality for lobectomy will improve, and consequently the prognosis in bronchiectasis also. Lobectomy may be said to offer the only hope of cure.

Moll[29] regards the mortality as high during childhood and states that in 41 autopsy cases in which death was due to bronchiectasis, 50% died before puberty and the highest mortality was in the first five years of life. He gives the following table of causes of death :-

Broncho-pneumonia	16
Empyema	10
Pyo-Pneumothorax	3
Lung Abscess	1
Gangrene of Lung	2
Fatal Haemoptysis	1
Abscess of Brain	3
Cardiac Failure	4
Nephritis	1

Total deaths from bronchiectasis - 41 (75%)
Total deaths from other causes - 14 (25%)

Bad signs are, finger clubbing, abundant sputum, foetid sputum.

Chandler[7] points out that the prognosis is much worse in the secondary type (even if due to foreign body).

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TREATMENT.

With the recent progress in thoracic surgery, the methods of treatment have now altered considerably, and surgery now holds a much more important place. Roles and Todd[43] followed 106 cases from 3 - 6 years, and found that there was a 51% mortality in medically-treated cases and a 30% mortality in surgically—treated cases.

Prophylaxis. Some cases of bronchiectasis are due to aspiration of septic material after operations on the nose and throat, and therefore care at such operations may help to prevent bronchiectasis.

Many are of the opinion that breathing exercises after pneumonia may help to prevent bronchiectasis. Anspach[1] has stressed the relationship of atelectasis to bronchiectasis, and is of the opinion that many cases of bronchiectasis follow atelectasis after acute respiratory infections, especially where there is inefficient drainage, and that many of these cases may be prevented by efficient drainage and re-expansion of the lungs by breathing exercises.

Medical Treatment. The most that can be expected from medical treatment is an amelioration or temporary cessation of symptoms, but no cure can be hoped for, except in very slight and early cases.

Rest in bed is rarely indicated except in advanced cases or during the febrile periods which commonly occur in the disease. Plenty of fresh air and sunlight, and good, wholesome food with high vitamin content, are essential in order to increase the general resistance. Breathing exercises are often very helpful. The patient should be encouraged to wear loose light clothing. Exercise may be taken according to toleration.

One of the most useful forms of medical treatment is drainage by posture. This may be done by raising the foot of the bed so that the head is lower than the feet. At first this should be done for ¼ to ½ an hour daily, and later increased to 1-2 hours daily. In this way the secretion in the tubes tends to drain out and excite coughing by which it is removed. Another method of obtaining drainage is to get the patient to lean over the edge of the bed.

Inhalation of vapours is often used as a method of treatment. Creosote vapour is one of the most popular. The vapour may be inhaled in a closed chamber, but usually it is sufficient to inhale it in an open tent. Beaumont[2] recommends inhalation of two or three drops of the following recipe by means of a Burney-Yeo mask every hour :-

Creosote	...	...	2 parts
Tr. Iod.	...	...	1 part
Sp. Chlorof...		...	2 parts
Sp. Aeth	...	...	1 part
Ac. Carbol....		...	2 parts

It is very important to attend to the upper air passages. McNeil[26] recommends spraying the nose and throat with glycerine.

Various expectorant and other drugs may be given internally. Some give creosote in doses of ℥ iii to ℥ v t.d.s. in the form of capsules. Another useful drug is Ol. Tereb. which may be given in doses of ℥ xv t.d.s.

Vaccines have been tried but have not been found to be effective.

Bronchoscopic drainage with lavage has been found to be an effective method of treatment. It improves both the general and local condition considerably. Pinchin and Morlock[39] advise weekly bronchoscopic drainage and lavage with saline, followed by instillation of gomenol.

Osler[34] recommends intra-tracheal injections of ℥ i of the following mixture :-

Menthol	...	...	10 parts
Ginacol	...	...	2 "
Ol. Oliv.	...	...	88 "

Surgical Treatment. Surgery now holds a much more important place in the treatment of bronchiectasis, and of late great progress has been made in thoracic surgery. Lobectomy is the only possible method of effecting a cure, but as yet the

operation mortality is large, although it will probably decrease in future. Apart from lobectomy, surgical treatment chiefly consists in different methods of procuring collapse, but most are agreed that these methods, even at best, are only palliative.

Artificial pneumothorax is advocated by some. It may produce temporary relief, but must be repeated frequently. Many writers (e.g. Roles and Todd[43], and James[20]), are of opinion that it should only be used as a pre-operative aid to lobectomy.

Phrenic avulsion is also of doubtful benefit. It should not be used before lobectomy (unless only division of the nerve or crushing is done), because it causes atrophy of the diaphragm and subsequent difficulty in re-expansion of the remaining lobe after lobectomy. Oakley[32] quotes 17 cases of bronchiectasis in which phrenic avulsion was performed with the following results :-

Complete relief :- 4	... ...	i.e. 24%
Lasting improvement :- 7	...	i.e. 41%
Temporary improvement :- 6	...	i.e. 35%

Thoracoplasty is seldom done now. Its chief indication is in extensive unilateral cases involving more than one lobe, where lobectomy is contra-indicated.

Drainage of the affected area through the chest has been done, but with little success.

Lobectomy is undoubtedly the ideal form of treatment, but as yet the indications for the operation are limited and, unfortunately, even in selected cases the mortality is high.

The operation should be reserved for unilateral cases affecting one lobe only. The subject should be in good general health and great care before and after operation is necessary. James[20] advises that the operation be done in summer. Roberts and Nelson[41] and others advise frequent bronchoscopic lavage before operation, and also collapse therapy. The operation mortality figures vary from 30 to 50%. Recently[25] two cases have been quoted in which a whole lung has been successfully removed for bronchiectasis.

Modern treatment has been summarised by Lloyd[24] and by Nelson[31]. The latter observer is of the opinion that the choice of treatment lies between (a) postural drainage and bronchoscopy and (b) lobectomy.

The fact that Roles and Todd[43] found a mortality of 30% in surgically-treated cases and 51% in medically-treated cases, in the series which they investigated, is a strong point in favour of the adoption of surgical methods whenever possible.

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In a recent article by Graham Bryce[51] the surgical treatment of bronchiectasis is summarised as follows :-

Incipient Stage :- Phrenic crush; (artificial pneumothorax).

Well-developed Stage :- (a) Drainage; postural, bronchoscopic, external. (b) Excision: cautery pneumonectomy (Graham), "Cuneo-resection" of Coquelet, "pneumectomie fragmentaire progressive" of Baumgartner; lobectomy. (c) Collapse: thoracoplasty; (artificial pneumothorax); (phrenic evulsion).

Bryce then points out that "Thoracic surgeons are more and more convinced, therefore, that the only really effective treatment of bronchiectasis is to remove the diseased area entirely", and states that all other surgical methods are "merely palliatives".

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S E C T I O N - CASES.

In this section a description will be given of twenty cases (all children), in twelve of which a diagnosis of bronchiectasis was made.

All these cases were personally observed by the writer, and all the investigations were carried out by the writer except (1) the bronchoscopic examination in Case 9, which had been done previously, and (2) the pathological examination in Case 11, which was done in a pathological laboratory, and (3) the examination of sputa, which was also done in a pathological laboratory.

The twelve cases of bronchiectasis were investigated as far as possible by a routine method and they are described in detail; a summary, with the conclusions arrived at, is added to each case. A few notes are added about the remaining eight cases which were found to have no bronchiectasis.

A bronchoscopic examination was made in each of the twenty cases with the exception of Cases 10 and 11 (these refused admission), and Case 12, which was a case of congenital bronchiectasis.

The technique adopted for bronchography was as follows :-

Each patient was given a hypodermic injection of atropine (dose according to age), half an hour before the bronchoscopic examination. In each case the opaque oil was injected by means of a 20 c.c. syringe and ordinary intravenous needle, or one of

slightly larger bore, and the injection was made through the crico-thyroid membrane or in the sub-cricoid region. General (ether) or local anaesthesia was used according to the age and type of patient. When using local anaesthesia, about ½ c.c. of 2% Novocaine was first injected into the skin and sub-cutaneous tissues with a hypodermic syringe and needle; the needle was then pushed into the trachea and a similar quantity of 1% cocain injected, the patient afterwards being instructed to cough gently.

Either Lipiodol or "Neo-Hydriol" was used for outlining the bronchi. The latter was found to be more convenient owing to its low viscosity, but it was found that when using it the X-ray photograph had to be taken without delay, otherwise the oil had left the bronchi and had been dispersed into the alveoli.

The oil was injected with the patient in a semi-recumbent position, and with an inclination to one side for one half of the injection and to the other side for the remaining half. Immediately after the injection the patient was X-rayed and then put in the recumbent position, and a further X-ray was taken after an interval of a few minutes.

The amount of oil used varied from 15 to 25 c.c.

The radiograms are shown at the end.

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CASE I. ADVANCED SACCULAR BRONCHIECTASIS AT THE LEFT BASE.

C A S E I.

Name - R.N. Age 12. Sex - M.

Admitted as urgent on 24/10/34.

History - Three days prior to admission suddenly felt pain in the left side of chest and abdomen. Pain was severe and was made worse by deep breathing. Pyrexia, dyspnoea and cough supervened.

Previous history - (1) Pneumonia at 5 weeks of age.

(2) Measles at 1½ years.

(3) Pneumonia at 3 years (said to be on the left side of the chest).

(4) Chronic cough since this last attack of pneumonia. The cough was a persistent "hacking" cough, worse in the morning. Occasionally, it was productive of a small quantity of mucoid sputum in the morning.

(5) No other illness of any note. Never had pertussis or influenza. No history of disease of, or operation on, the nose and throat. No history of aspiration of foreign body. Never had any haemoptysis.

Clinical Notes - Acutely ill on admission. Dyspnoeic and cyanosed. Temperature 101° F., pulse rate 144, and respirations 44 per minute.

The Chest - Dullness and tubular breath sounds with fine inspiratory crepitations at the left base. Rest of chest normal.

25/10/34 (Day after admission) - General condition much improved. Temperature 97° F., pulse rate 96, respirations 28 per minute. Physical signs on chest unchanged.

The general condition continued to improve, and the temperature and pulse rate remained normal. Cough slight and productive of a small quantity of mucoid sputum daily. The dullness at the left base gradually decreased and the breath sounds became vesicular. Coarse crepitations, however, persisted at the left base for over a month. In view of this, a radiogram was taken on 15/11/34. This did not show any sign of disease of the lungs. There was no evidence of atelectasis.

20/11/34. - 20 c.c. Lipiodol given through crico-thyroid membrane under local anaesthesia. This showed advanced saccular bronchiectasis at left base. There was also a suggestion of early tubular bronchiectasis at the right base. There were no ill-effects of this procedure.

Other Investigations - Von Pirquet negative. Sputum - no spirochètes, fusiform bacilli, or tubercle bacilli seen. Organisms cultured - (1) Pneumococcus; (2) Micrococcus catarrhalis; (3) Streptococcus viridans; (4) Bacillus influenzae (Pfeiffer).

Treatment - Routine treatment for pneumonia. Lobectomy considered but not advised. Expectorant mixtures given.

Condition on Discharge - General condition good. Well nourished. Good muscle tone. Height 49½ inches. Weight 5 st. 7 lbs. No cyanosis or finger clubbing. No dyspnoea. No disease of ear, nose or throat. Occasional cough. Practically no sputum.

Chest - well formed. Movements good and equal on both sides. No dullness. Harsh vesicular breath sounds all over. Occasionally crepitations at the left base.

N.B. - Attended subsequently as an out-patient. Slight but definite finger clubbing noticed six weeks after discharge. Cough still troublesome and becoming more productive of muco-purulent sputum. Crepitations sometimes heard at left base.

S U M M A R Y.

1.	Sex	Male
2.	Age at observation	12 years.
3.	Probable age of onset	3 "
4.	Probable duration	9 "
5.	History of aspiration of foreign body ...	No.
6.	" " Measles	Yes.
7.	" " Pertussis	No.
8.	" " Bronchitis	No.
9.	" " Pneumonia	Yes.
10.	General condition	Good.
11.	Height	56 inches
12.	Weight	5 st. 7 lbs.
13.	Upper air passages	Nil. of note.
14.	Haemoptysis	No.
15.	Clubbing	Yes.
16.	Dyspnoea	No.

17.	Cyanosis	No.
18.	Temperature	No.
19.	Physical signs on chest	Abnormal.
20.	Sputum	Slight.
21.	Spirochetes and fusiform bacilli	No.
22.	Tubercle bacilli	No.
23.	Other organisms	Various.
24.	Tuberculin test	Negative.
25.	Radiogram	Normal.
26.	Atelectasis	No.
27.	Evidence of fibrosis	No.
28.	Toxic symptoms after bronchography	None.
29.	Distribution and site	Left base.
30.	Type	Saccular.
31.	Treatment	Expectorants
32.	Prognosis	Poor.

CONCLUSIONS.

This is a case of advanced saccular bronchiectasis. It is considered as a unilateral case affecting the left base, but there is possibly also some early tubular bronchiectasis at the right base.

Owing to the history of chronic cough since the attack of pneumonia at the age of three, one can assume that the condition is of nine years' duration. During those nine years it remained a case of dry bronchiectasis, but it has been aggravated by the

recent attack of pneumonia and has now become a wet case.

It shows the importance of considering the possibility of bronchiectasis in a case of pneumonia in which the physical signs show delay in clearing, and it emphasises the necessity of using lipiodol to diagnose the condition, because in this case there were only few abnormal physical signs and the ordinary radiogram did not show any evidence of disease.

This case, which is of nine years' duration, shows that the condition may be compatible with long life, and comparative freedom from symptoms and abnormal physical signs. On the other hand, there is always the possibility of a further attack of pneumonia developing which will aggravate the condition.

Since the case has now become a wet one, and finger clubbing is present, the prognosis is not good. Lobectomy offers a chance of a cure, but owing to the risks involved it was not considered justifiable.

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CASE II ADVANCED SACCULAR BRONCHIECTASIS BOTH BASES.

C A S E 2.

Name - A.F. Age - 6. Sex - M.

First attended as out-patient for debility and chronic cough. Admitted later for investigation.

History - Severe attack of pneumonia at age of 8 months. Chronic cough since this. Cough slight and unproductive until a year ago, since when it has become worse and has been productive of muco-purulent sputum. Anorexia and loss of weight during past year. Dyspnoea on exertion.

Measles at age 3 - slight and uncomplicated.

Pertussis at age 4 - " " "

Never had bronchitis. No history of aspiration of foreign body, of haemoptysis, or of disease of, or operation on, nose and throat.

On admission - Nutrition poor. Atonic. Pale and slightly cyanosed. Marked clubbing of fingers and toes. Height 45¾ inches. Weight 2 st. 10 lbs. Marked mouth breather. Tonsils small and red. Slight dental caries.

Chest - Well formed. Both bases move equally but movement is poor. Impaired percussion both bases. Creaking rales all over, but especially at bases. Bubbling Crepitations both bases. No bronchial breathing.

Investigations - Von Pirquet negative. Sputum - no tubercle bacilli, spirochetes, or fusiform bacilli seen. Organisms cultured - (1) streptococcus viridans; (2) bacillus influenzae

(Pfeiffer); (3) micrococcus catarrhalis.

X-Ray of Chest - Increased markings at both bases suggesting chronic fibrosis. No evidence of atelectasis.

1/2/34 - 20 c.c. of "Neo Hydriol" injected through crico-thyroid membrane under general anaesthesia. A subsequent X-ray showed advanced saccular bronchiectasis at both bases. There were no ill-effects to this procedure.

Observations - Patient had occasional evening rises of temperature of 100° F. to 101° F. At one time he had an intermittent temperature (98° F. to 102° F.) for ten days, with no change in the general condition or physical signs on chest. Cough was persistent and loose, but there was difficulty in persuading patient to expectorate. When he did so, muco-purulent sputum was obtained.

Treatment - Expectorant mixtures, cod liver oil emulsion, ultra-violet light. Attempts made at postural drainage but the child did not co-operate well.

S U M M A R Y.

1.	Sex	Male.
2.	Age at observation	6 years.
3.	Probable age of onset	8 months.
4.	Probable duration	5 years.
5.	History of aspiration of foreign body	No.
6.	" " Measles	Yes.

7.	History of Pertussis	Yes.
8.	" " Bronchitis	No.
9.	" " Pneumonia	Yes.
10.	General condition	Poor.
11.	Height	$45\frac{3}{4}$ inches.
12.	Weight	2 st. 10 lbs
13.	Upper air passages	Mouth breather.
14.	Haemoptysis	No.
15.	Clubbing	Yes.
16.	Dyspnoea	Yes.
17.	Cyanosis	Yes.
18.	Temperature	Yes.
19.	Physical signs on chest	Abnormal.
20.	Sputum	Yes.
21.	Spirochetes and fusiform bacilli	No.
22.	Tubercle bacilli	No.
23.	Other organisms	Various.
24.	Tuberculin tests	Negative.
25.	Radiogram	Abnormal.
26.	Atelectasis	No.
27.	Evidence of fibrosis	Yes.
28.	Toxic symptoms after bronchography	None.
29.	Distribution and site	Both bases.
30.	Type	Saccular.
31.	Treatment	General medical.
32.	Prognosis	Poor.

CONCLUSIONS.

This is an advanced case of saccular bronchiectasis affecting both bases. It resembles the typical case described in text-books, except that the sputum is neither abundant nor foul. From the history it is evident that the condition originated in the attack of pneumonia at the age of eight months. The attacks of measles and pertussis would further aggravate the condition, but it remained a dry case for four years, but is now an advanced wet case. The similarity of the X-ray appearances on both sides suggests that it has probably been bilateral from the onset.

There is evidence of fibrosis, both from physical examination (impaired percussion and poor movement) and X-ray appearances, but there is no evidence that the fibrosis was the primary condition.

The prognosis is bad since the general condition is poor and the disease is bilateral.

Only general medical treatment is likely to be of any help. Postural drainage was unsuccessful and vapour treatment is not indicated yet as the sputum is not foetid. There is no question of surgical treatment because the disease is bilateral.

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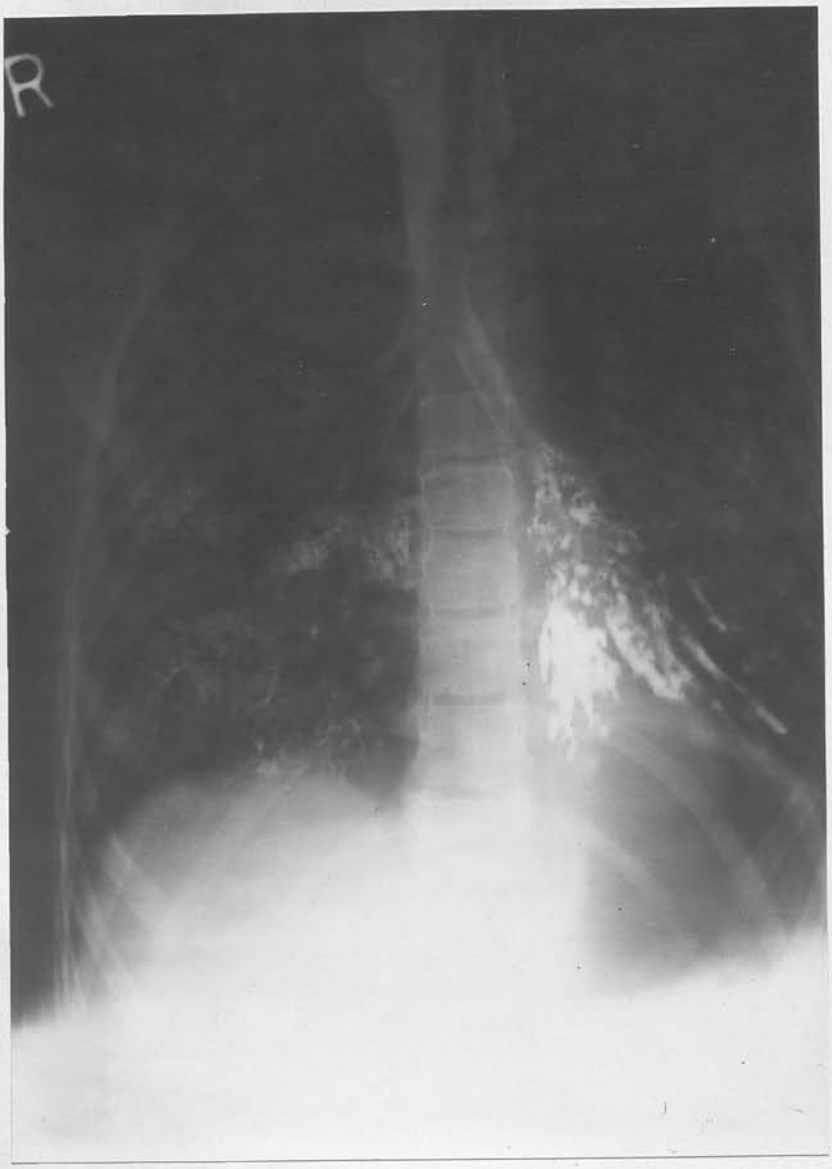

CASE III. FUSIFORM BRONCHIECTASIS LEFT BASE

C A S E 3.

Name - E.M. Age - 6. Sex - Female.

Referred from Tuberculosis Dispensary (where she had been attending for two years) as a probable case of bronchiectasis.

History :- Severe attack of measles at age of three followed by acute bronchitis. Constant loose cough since, occasionally (chiefly during the morning) productive of a small quantity of muco-purulent sputum during the past six months.

Temporary bilateral otorrhoea six months after measles.

Pertussis six months ago.

Tonsils and adenoids removed at age of four.

Never had pneumonia. No history of haemoptysis or of aspiration of foreign body.

Dyspnoea on exertion recently.

Examination - Nutritition, muscle tone, and colour good.

Definite finger clubbing.

Height 45½ inches. Weight 2 st. 12½ ozs.

Slight dental caries. No disease of nose or throat.

Chest - Well formed. Movements good and equal on both sides. Impaired percussion at left base. Harsh vesicular breath sounds. No diminution of air entry. Creaking rales at both bases but chiefly the left.

Clinical Notes - Admitted for investigation 22/12/34. Von Pirquet negative.

Sputum - about ½ oz. of muco-purulent sputum daily. Not offensive.

Sputum report - No tubercle bacilli, spirochetes, or fusiform bacilli seen. Organisms cultured were -

(1) pneumococcus; (2) streptococcus viridans; (3) staphalococcus; (4) bacillus influenzae (Pfeiffer); (5) micrococcus catarrhalis.

X-ray of chest - No abnormality seen. No evidence of fibrosis or of atelectasis.

Under general anaesthesia 20 c.c. of "Neo-Hyrdiol" were injected by the sub-cricoid route. A subsequent radiogram showed definite fusiform bronchiectasis at the left base. There were no ill effects after this.

No rise in temperature occurred while in hospital.

Treatment - Expectorant mixtures. Postural drainage for twenty minutes daily. Much sputum obtained by this method and patient co-operated well. Artificial pneumothorax or lobectomy considered and discussed but advised against.

S U M M A R Y.

1.	Sex	Female
2.	Age at observation	6 years.
3.	Probable age at onset	3 "
4.	Probable duration	3 "
5.	History of aspiration of foreign body	No.
6.	" " Measles	Yes.

7.	History of Pertussis	Yes.
8.	" " Bronchitis	Yes.
9.	" " Pneumonia	No.
10.	General condition	Good.
11.	Height	45½ inches.
12.	Weight	2 st. 12 lbs.
13.	Upper air passages	Satisfactory.
14.	Haemoptysis	No.
15.	Clubbing	Yes.
16.	Dyspnoea	Yes.
17.	Cyanosis	No.
18.	Temperature	No.
19.	Physical signs on chest	Abnormal.
20.	Sputum	Yes.
21.	Spirochetes and fusiform bacilli	No.
22.	Tubercle bacilli	No.
23.	Other organisms	Various.
24.	Tuberculin tests	Negative.
25.	Radiogram	Normal.
26.	Atelectasis	No.
27.	Evidence of fibrosis	No.
28.	Toxic symptoms after bronchography	None.
29.	Distribution and site	Left base.
30.	Type	Fusiform
31.	Treatment	Drainage.
32.	Prognosis	Poor.

CONCLUSIONS.

This is a case of fusiform bronchiectasis affecting the left base. It is a case in which the aetiology is definite. Since the attack of measles and bronchitis there has been chronic cough, and in the absence of any other respiratory illness (except recent pertussis) one must conclude that the condition originated in the attack of measles and bronchitis, i.e. it is of three years' duration.

It evidently remained dry for 2½ years and was then aggravated by an attack of pertussis and became moist.

The clinical picture in this case was sufficient to enable a provisional diagnosis of bronchiectasis to be made. The ordinary radiogram, however, did not show any abnormality, and from this one concludes that an ordinary radiogram can not be relied upon in making a diagnosis of bronchiectasis.

The prognosis in this case is not good, since finger clubbing is present, and the case is a moist one.

Postural drainage was considered the most satisfactory method of treatment. Lobectomy was offered but the parents were unwilling for the risk to be taken. Artificial pneumothorax was advised against in that it was considered as a mere palliative.

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CASE IV SACCULAR BRONCHIECTASIS LEFT BASE.

C A S E 4.

Name - E.L. Age - 7. Sex - Female.

First attended out-patient department for impetigo. Persistent cough noticed. Enquiries made.

History - Measles followed by pneumonia at age three. Chronic cough since this. A persistent dry cough until the last two months when it became productive of small quantities of muco-purulent sputum daily. Pneumonia "seven or eight times". Never had bronchitis. Pertussis at age one. No history of haemoptysis or of aspiration of foreign body. No dyspnoea.

Born with severe hare-lip and cleft palate. Lip repaired successfully soon after birth. Three unsuccessful attempts made to repair the palate. No respiratory complication after any of these operations.

Been attending a Tuberculosis Dispensary for two years.

Examination - Nutrition, muscle tone and colour good. Finger clubbing present. Height 44¼ inches. Weight 2 st. 10 lbs. 2 ozs. Scar of repaired hare-lip visible. Complete cleft palate present. Slight dental caries. Tonsils small and red.

Chest - Well formed. Movements good and equal on both sides. Impaired percussion at left base. Vesicular breath sounds. Air entry good and equal on both sides. Bubbling crepitations at left base.

Clinical Notes - Admitted 16/1/35. Von Pirquet negative.

Sputum - occasional small quantities of muco-purulent sputum.

Sputum report - No tubercle bacilli, spirochetes or fusiform bacilli seen. Organisms cultured were - (1) streptococcus (haemolyticus and viridans); (2) micrococcus catarrhalis; (3) staphalococcus albus.

X-ray Chest - Slight increase in markings at left base suggesting fibrosis. No atelectasis seen. 20 c.c. "Neo-Hydriol" given under local anesthesia by sub-cricoid route. A subsequent X-ray showed definite saccular bronchiectasis at the left base. No illeffects after this.

No temperature while in ward.

Treatment - Expectorant mixtures. Postural drainage for 15 minutes daily with encouraging results. Artificial pneumothorax or lobectomy discussed but not advised.

S U M M A R Y.

1.	Sex	Female.
2.	Age at observation	7 years.
3.	Probable age of onset	3 "
4.	Probable duration	4 "
5.	History of aspiration of foreign body ...	No.
6.	" " Measles	Yes.
7.	" " Pertussis	Yes.
8.	" " Bronchitis	No.
9.	" " Pneumonia	Yes.

10.	General condition	Good.
11.	Height	44¼ inches.
12.	Weight	2 st. 10 lbs. 2 ozs.
13.	Upper air passages	Cleft Palate.
14.	Haemoptysis	No.
15.	Clubbing	Yes.
16.	Dyspnoea	No.
17.	Cyanosis	No.
18.	Temperature	No.
19.	Physical signs on chest	Abnormal
20.	Sputum	Yes.
21.	Spirochetes and fusiform bacilli	No.
22.	Tubercle bacilli	No.
23.	Other organisms	Various.
24.	Tuberculin tests	Negative.
25.	Radiogram	Abnormal.
26.	Atelectasis	No.
27.	Evidence of fibrosis	Doubtful.
28.	Toxic symptoms after bronchography	None.
29.	Distribution and site	Left base.
30.	Type	Saccular.
31.	Treatment	Postural drainage.
32.	Prognosis	Poor

CONCLUSIONS.

This is a case of saccular bronchiectasis affecting the left base. It is interesting to note that the patient first attended for impetigo; the chest condition was not considered by the parents to be of sufficient importance to merit attention, and it was only by noticing the persistent cough and enquiring into the history that the condition was suspected. This shows that cases may progress for years with little or no symptoms.

At first sight it might be thought that this case arose as the result of aspiration of septic material, after the operations on the lip and palate. This is, however, unlikely since there is no history of any respiratory complication after these operations. The origin of the cough after the first attack of pneumonia at age three suggests that this was the cause. Each subsequent attack of pneumonia would aggravate the condition. At the same time, the cleft palate probably played an indirect part in the aetiology in that it would pre-dispose to the attacks of pneumonia.

One can assume, then, that the condition is of four years' duration, and that during these four years it has remained dry, but is now becoming moist. In view of this latter fact, the prognosis is not good, especially since there is finger clubbing also.

Lobectomy was decided against in view of its risks.

CASE V. FUSIFORM BRONCHIECTASIS LEFT BASE.

Artificial pneumothorax was not considered necessary at present, but may be resorted to later when expectoration becomes more profuse.

---oOo---

C A S E 5.

Name - E.O. Age - 14. Sex - Female.

First attended as out-patient for cough and failure to gain weight.

History - Tonsillitis nine months ago. Since then constant hard dry cough; no sputum. Appetite good. No dyspnoea. No haemoptysis. No history of aspiration of foreign body. Measles at age of five. This was not severe, but was accompanied by troublesome cough but no respiratory complication. No history of pertussis, bronchitis or pneumonia, or of disease of or operation on nose or throat.

Examination - Nutrition, colour and muscle tone good. No finger clubbing. Height 58½ inches. Weight 5 st. 6 lbs. 2 ozs. Mouth breather. No disease of nose. Tonsils enlarged. Teeth good.

Chest - Well formed. Movements good and equal on both sides. Percussion note resonant. Vesicular breath sounds all over. Good air entry. No adventitious sounds.

Clinical Notes - Admitted 21/12/34. for investigation. A plain radiogram did not show any abnormality beyond a slight increase in markings at the left hilum. There was no evidence of fibrosis or of atelectasis. 25 c.c. of "Neo-Hydriol" were then injected through the sub-cricoid region under local anesthesia. An X-ray taken immediately after this injection showed slight but definite fusiform bronchiectasis at the left base. There was also a suspicion of similar dilatation at the right base but this was not definite. It is interesting to note that a further X-ray taken 5 minutes later failed to show any dilatation satisfactorily, as the oil had been dispersed into the alveoli by deep inspirations and the bronchial shadows had become obscured. There were no ill effects to this procedure.

Other Observations - No rise of temperature while in hospital. Slight persistent hard cough. No sputum, except after postural drainage the day after "Neo-Hydriol" was given.

Sputum Report - No tubercle bacilli, spirochetes or fusiform bacilli seen. Organisms cultured were - (1) pneumococcus; (2) streptococcus of three varieties, viz - haemolyticus, viridans and non-haemolyticus; (3) micrococcus catarrhalis; (4) staphalococcus aureus.

Von Pirquet positive.

Seen subsequently as an out-patient, there was no change in the general condition. Cough persisted. No sputum. On one occasion bubbling rales were heard at the left base.

S U M M A R Y.

1.	Sex	Female.
2.	Age at observation	14 years.
3.	Probable age of onset	5 "
4.	Probable duration	9 "
5.	History of aspiration of foreign body ...	No.
6.	" " Measles	Yes.
7.	" " Pertussis	No.
8.	" " Bronchitis	No.
9.	" " Pneumonia	No.
10.	General condition	Good.
11.	Height	58½ inches.
12.	Weight	5 st. 6 lbs. 2 ozs.
13.	Upper air passages	Mouth breather.
14.	Haemoptysis	No.
15.	Clubbing	No.
16.	Dyspnoea	No.
17.	Cyanosis	No.
18.	Temperature	No.
19.	Physical signs on chest	Normal.
20.	Sputum	No (once only)
21.	Spirochetes and fusiform bacilli	No.
22.	Tubercle bacilli	No.
23.	Other organisms	Various.
24.	Tuberculin tests	Positive.

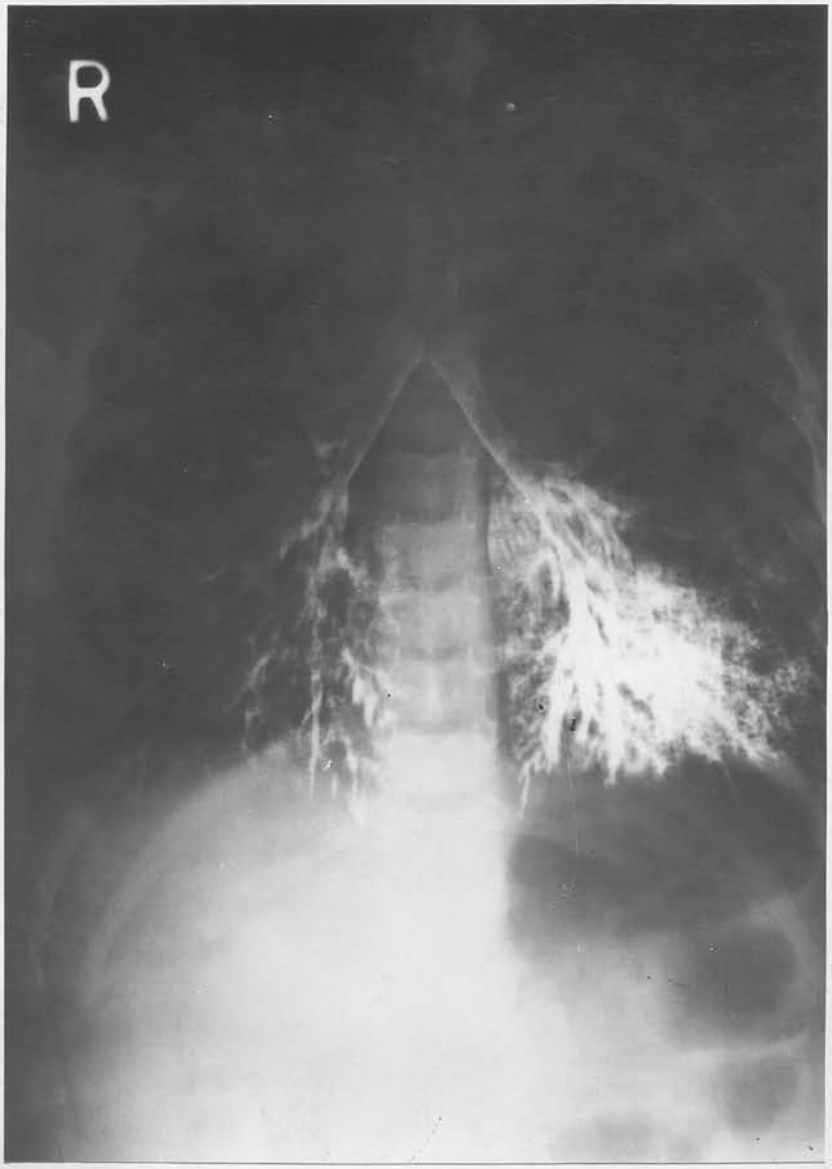
25.	Radiogram	Normal.
26.	Atelectasis	No.
27.	Evidence of fibrosis	No.
28.	Toxic symptoms after bronchography	None.
29.	Distribution and site	Left base.
30.	Type	Fusiform
31.	Treatment	Expectorants.
32.	Prognosis	Good.

CONCLUSIONS.

This is a case of early fusiform bronchiectasis affecting the left base. There may be also slight dilatation at the right base but the evidence of this is not sufficient for a diagnosis.

An interesting point is the absence of any history of respiratory disease. One, therefore, concludes that the condition originated in the attack of measles at age five and that it is, therefore, of nine years' duration. During this time it must have lain dormant until the recent repeated "colds" have aggravated it. Yet it still remains a dry case with a good prognosis so long as it remains so, but if any respiratory disease occurs in the future it will certainly aggravate the condition and probably cause it to become wet.

In this case the tuberculin (Von Pirquet) test was positive but there was no evidence to show that there was any active tuberculosis, either from clinical or radiological examination, or from examination of the sputum.



CASE VI TUBULAR BRONCHIECTASIS LEFT BASE.

The only thing in this case which suggested the possibility of bronchiectasis was the chronic cough. The history, clinical findings and radiogram did not lead to a diagnosis of bronchiectasis, and here is an example of the value of bronchography in arriving at a diagnosis. On the other hand, a possible fallacy in the use of "Neo-Hydriol" (which is less viscid than lipiodol) was demonstrated, viz :- that the dilatation may not show up unless the X-ray picture is taken immediately after injection.

It is desirable that such a case as this should be kept under observation, but there is no indication for treatment meantime.

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C A S E 6.

Name - K.R. Age - 5. Sex - Male.

Sent into hospital 20/11/34 with provisional diagnosis of tuberculous abdomen.

History - A month before admission developed measles complicated by mild bronchitis. Good recovery, but three weeks later developed abdominal pain which persisted for a week. At the same time there were signs of generalised bronchitis, there was increasing abdominal protuberance and wasting.

Previous History - Pneumonia four times. First time at age of six months. Bronchitis every winter. Chronic cough for years (exact duration not known). Sputum only during attacks of

bronchitis. Never had haemoptysis. No history of aspiration of foreign body. No history of disease of, or operation on, ear, nose or throat.

Clinical Notes - On admission - A pale, wasted, atonic, toxic child. Slight dyspnoea. Temperature normal.

Abdomen - Distended and tympanitic. No signs of free fluid. No mass palpable. No tenderness.

The Chest - A well-formed chest. Movements good and equal on both sides. Resonant percussion note. Vesicular breath sounds. Medium-pitched rhonci all over but especially at the bases. Severe cough, spasmodic in nature, noticed on admission. Definite "whoop" next day. Isolated.

6/12/34. General condition much better. Gaining weight rapidly. Cough as before and accompanied by mucoid sputum. Chest clear.

17/12/34. Improvement continues. Cough less troublesome. No sputum. Chest clear.

Investigations - Von Pirquet negative. Mantaux (1 in 1,000) negative.

Sputum Report - Fairly numerous pus cells. No tubercle bacilli, spirochetes, or fusiform bacilli seen. Organisms cultured were - (1) pneumococcus; (2) micrococcus catarrhalis; (3) streptococcus non-haemolyticus.

X-ray Chest - No signs of disease. No atelectasis. No fibrosis.

11/1/35 - 20 c.c. of lipiodol given by sub-cricoid route under general anaesthesia. A subsequent X-ray showed early tubular bronchiectasis at the left base. A few minutes after injection

sub-cutaneous emphysema was noticed in the neck. This rapidly spread in all directions. In a few hours it was at its maximum and had spread over the face, scalp, thorax and abdomen and both arms. No embarrassment was caused and the emphysema gradually disappeared and in a week's time had completely cleared.

Condition on discharge - General condition good. Well nourished. Muscle tone good. Colour good. No dyspnoea. No clubbing. Height 3 ft. 4 inches. Weight 2 st. 3 lbs. No disease of nose or throat. Cough only slight. No sputum. Chest clear.

S U M M A R Y.

1.	Sex	Male.
2.	Age at observation	5 years.
3.	Probable age of onset	6 months.
4.	Probable duration	4½ years.
5.	History of aspiration of foreign body ...	No.
6.	" " Measles	Yes.
7.	" " Pertussis	Yes.
8.	" " Bronchitis	Yes.
9.	" " Pneumonia	Yes.
10.	General condition	Good.
11.	Height	3 ft. 4 ins.
12.	Weight	2 st. 3 lbs.
13.	Upper air passages	Satisfactory.
14.	Haemoptysis	No.
15.	Clubbing	No.

16.	Dyspnoea	No.
17.	Cyanosis	No.
18.	Temperature	No.
19.	Physical signs on chest	Normal.
20.	Sputum	Occasional.
21.	Spirochetes and fusiform bacilli	No.
22.	Tubercle bacilli	No.
23.	Other organisms	Various.
24.	Tuberculin tests	Negative.
25.	Radiogram	Normal.
26.	Atelectasis	No.
27.	Evidence of fibrosis	No.
28.	Toxic symptoms after bronchography	None. (Subcutaneous emphysema)
29.	Distribution and site	Left base.
30.	Type	Tubular.
31.	Treatment	None.
32.	Prognosis	Good.

CONCLUSIONS.

This is a case of unilateral tubular bronchiectasis affecting the left base. It is not an advanced case as the lipiodol X-rays show, and in view of the fact that sputum is only present occasionally, it can be classed as a dry case. In view of the slight degree of dilatation it might be considered to have arisen as a result of the recent attack of measles and whooping-

cough with bronchitis. The history, however, of frequent pneumonia and bronchitis and chronic cough suggest that it probably arose after the first attack of pneumonia, i.e. it is probably of 4½ years' duration. If so, it is remarkable that its progress has been so slow, and it illustrates the fact that dry cases may go on for years with a fairly good prognosis so long as they remain dry.

A history of chronic cough and repeated attacks of pneumonia, then, should always arouse the suspicion of bronchiectasis even if there are no abnormal physical signs on the chest and the radiogram is normal.

The onset of surgical emphysema after sub-cricoid injection is an interesting complication, and one which is not usually recognised as a possibility.

The prognosis in this case is good and there is no indication for any treatment meantime.

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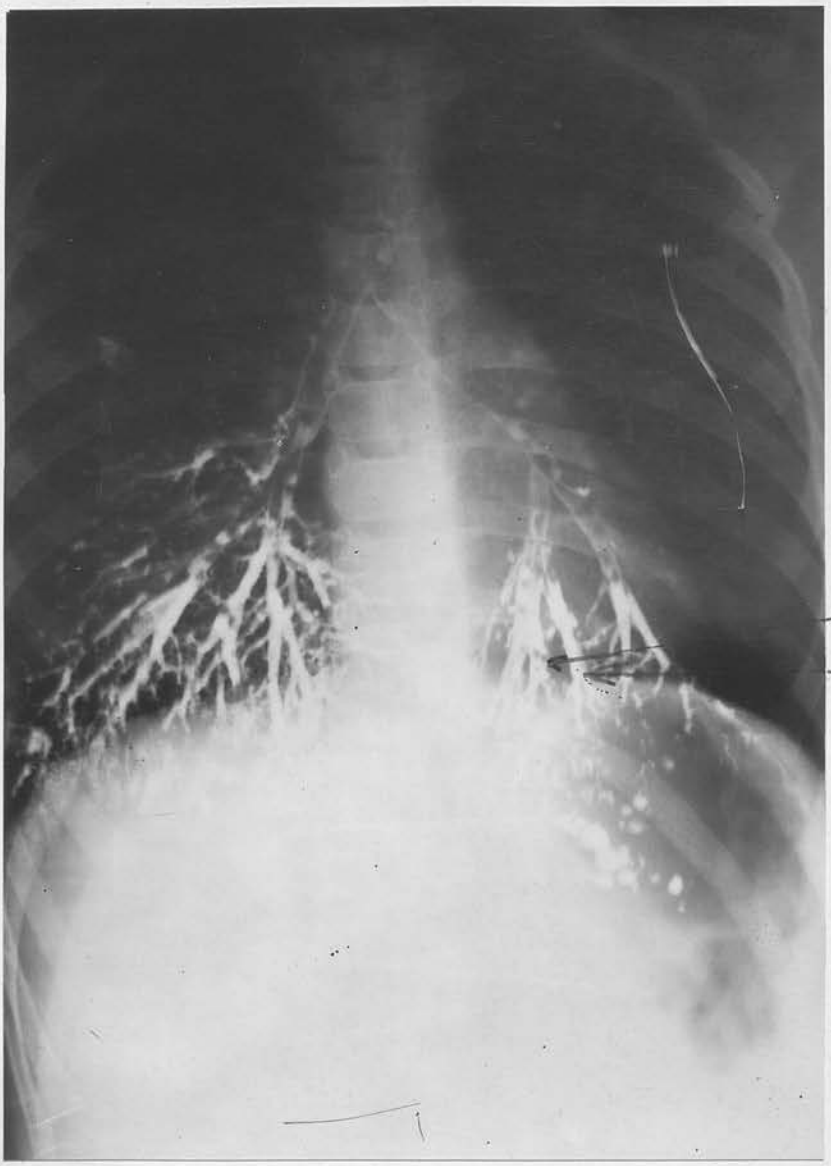


CASE VII. SLIGHT TUBULAR BRONCHIECTASIS LEFT BASE. (T)

C A S E 7.

Name - H.G. Age - 5. Sex - Male.

First attended as out-patient for chronic cough.

History - Measles at age two, followed by pneumonia. Chronic dry cough since. Never any sputum. Pneumonia again at age three. Frequent attacks of acute bronchitis since.

Never had pertussis. No history of disease of, or operation on, ear, nose and throat. No history of aspiration of foreign body. No dyspnoea. A year ago had haemoptysis, lasting a few days. Sent to Tuberculosis Dispensary because of this, and has been attending there since.

Examination - Nutrition, muscle tone and colour good. Height 46½ inches, weight 2 st. 11¾ lbs. No clubbing. No disease of nose or throat.

Chest - Well formed. Movements good and equal on both sides. Resonant percussion note. Harsh vesicular breath sounds. No accompaniments.

Clinical Notes - Admitted 27/9/34 for investigation. Von Pirquet negative.

X-Ray Chest - No abnormality seen. No atelectasis and no fibrosis.

15 c.c. of Lipiodol were given under general anaesthesia through the crico-thyroid membrane. A subsequent X-ray showed slight tubular bronchiectasis at the left base. There was also a suggestion of tubular bronchiectasis at the right base. There

were no ill effects to this.

Persistent cough while in ward. No sputum (even after lipiodol). No temperature. On one occasion crepitations were heard at the left base.

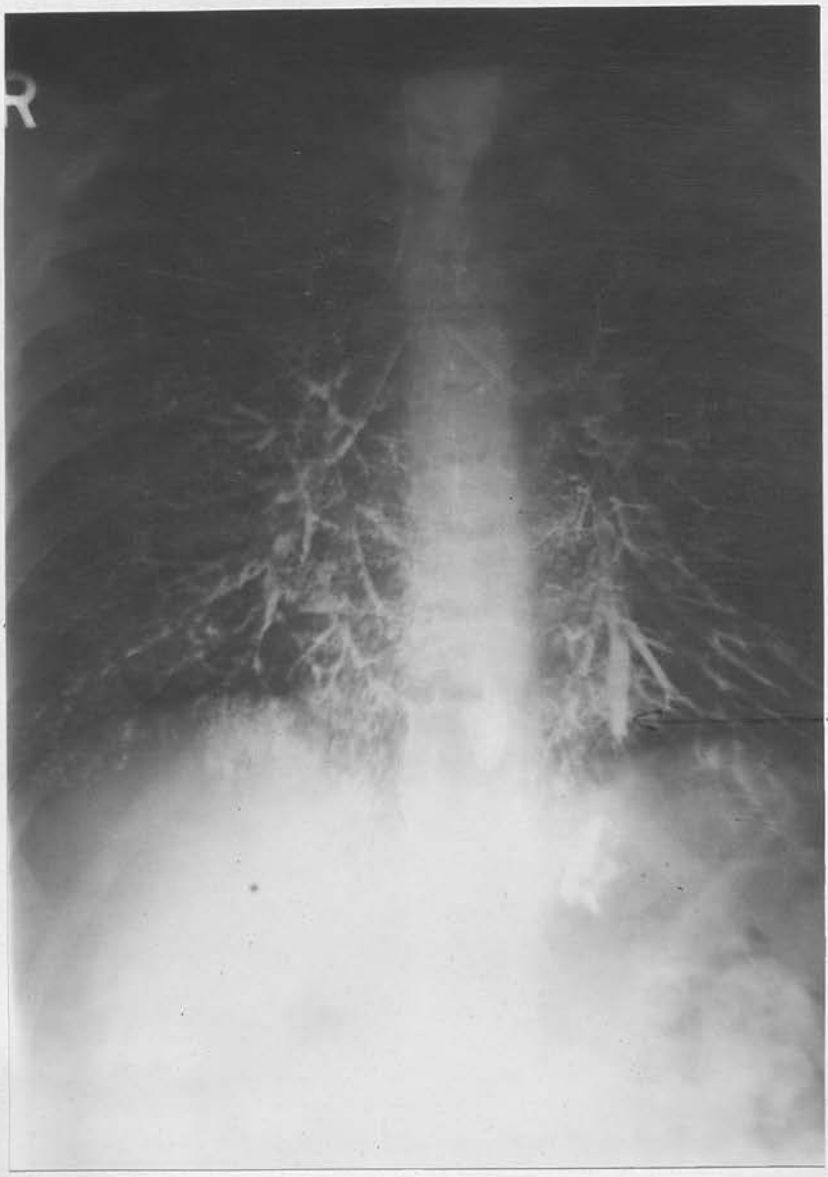
S U M M A R Y.

1.	Sex	Male.
2.	Age at observation	5 years.
3.	Probable age at onset	2 "
4.	Probable duration	3 "
5.	History of foreign body	No.
6.	" " Measles	Yes.
7.	" " Pertussis	No.
8.	" " Bronchitis	Yes.
9.	" " Pneumonia	Yes.
10.	General condition	Good.
11.	Height	46½ inches.
12.	Weight	2 st. 11¾ lbs
13.	Upper air passages	Satisfactory
14.	Haemoptysis	Yes.
15.	Clubbing	No.
16.	Dyspnoea	No.
17.	Cyanosis	No.
18.	Temperature	No.
19.	Physical signs on chest	Normal.

20.	Sputum	None.
21.	Spirochetes and fusiform bacilli	-
22.	Tubercle bacilli	-
23.	Other organisms	-
24.	Tuberculin tests	Negative.
25.	Radiogram	Normal.
26.	Atelectasis	No.
27.	Evidence of fibrosis	No.
28.	Toxic symptoms after bronchography	None.
29.	Distribution and site	Left base.
30.	Type	Tubular.
31.	Treatment	None.
32.	Prognosis	Good.

CONCLUSIONS.

This is a case of slight tubular bronchiectasis affecting the left base. It is a dry case and an interesting point is the history of haemoptysis. The negative Von Pirquet test shows that this was not due to tuberculosis. Evidently the trouble began in the attack of measles and pneumonia, as the cough has been present since then, i.e. it is of three years' duration. The only symptom, apart from haemoptysis, is chronic cough; only on one occasion were abnormal physical signs found on the chest, and the radiogram was normal. Therefore, one should always suspect bronchiectasis if there is a history of



CASE VIII SLIGHT TUBULAR BRONCHIECTASIS LEFT BASE (T)

cough and haemoptysis, if tuberculosis can be excluded.

The prognosis in this case is good and there is no indication for any treatment meantime.

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C A S E 8.

Name - J.T. Age - 8. Sex - Male.

First attended as out-patient for periodic attacks of abdominal pain and vomiting.

History - For past six years has had attacks of abdominal pain with nausea and vomiting. These occur, on an average, about once per month. Sometimes they are accompanied by passage of bright red blood per rectum, and rectal prolapse. Never constipated.

Measles and pertussis in infancy. Pneumonia nine months ago. Persistent hard cough since. No sputum. Never had bronchitis. No history of haemoptysis or of aspiration of foreign body. No history of disease of, or operation on, nose or throat. No dyspnoea.

Examination - Nutrition good. Rather pale and flabby. No cyanosis. No clubbing. No disease of nose or throat.

Height 51 inches, weight 4 st. 2½ lbs.

Abdomen - No abnormality on physical examination.

Chest - Well formed. Movements good and equal on both sides. Resonant percussion note. Vesicular breath sounds with harsh rhonchi at the bases.

Clinical Notes - Admitted 21/12/34 for observation and investigation. Von Pirquet negative.

X-ray of Abdomen - No abnormality seen.

X-ray of Chest - No sign of disease. No atelectasis. No fibrosis. 25 c.c. of Lipiodol were injected under local anaesthesia by the sub-cricoid route. A subsequent X-ray showed slight tubular bronchiectasis at the left base. There were no ill effects after this.

Further observations - Kept under observation in ward for one month. Appetite good. No nausea, vomiting or abdominal pain. No blood passed per rectum. Bowels moved regularly. Stools normal in appearance.

Persistent cough. Never any sputum (even after lipiodol). No elevation of temperature. No abnormal signs on chest at any examination.

S U M M A R Y.

1.	Sex	Male.
2.	Age at observation	8 years.
3.	Probable age of onset	7 "
4.	Probable duration	9 months.
5.	History of aspiration of foreign body	No.

6.	History of measles	Yes.
7.	" " pertussis	Yes.
8.	" " bronchitis	No.
9.	" " pneumonia	Yes.
10.	General condition	Good.
11.	Height	51 inches.
12.	Weight	4 st. 2½ lbs.
13.	Upper air passages	Satisfactory.
14.	Haemoptysis	No.
15.	Clubbing	No.
16.	Dyspnoea	No.
17.	Cyanosis	No.
18.	Temperature	No.
19.	Physical signs on chest	Normal.
20.	Sputum	None.
21.	Spirochetes and fusiform bacilli	-
22.	Tubercle bacilli	-
23.	Other organisms	-
24.	Tuberculin tests	Negative.
25.	Radiogram	Normal.
26.	Atelectasis	No.
27.	Evidence of fibrosis	No.
28.	Toxic symptoms after bronchography	None.
29.	Distribution and site	Left base.
30.	Type	Tubular
31.	Treatment	None.
32.	Prognosis	Good.

CASE IX. TUBULAR BRONCHIECTASIS LEFT BASE.

CONCLUSIONS.

This is a case of slight tubular bronchiectasis at the left base. The only symptom was cough, and it was not for this that the patient attended. It is another case which shows that bronchiectasis may exist in the absence of abnormal physical signs and with a normal radiogram.

It is a dry case and evidently originated in the attack of pneumonia nine months before. It is possible that the condition may yet clear up entirely. The prognosis is, therefore, good, and there is no indication for any treatment.

A satisfactory explanation of the cause of the attacks of abdominal pain, etc., was not made, but the patient is being kept under observation as an out-patient.

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C A S E 9.

Name - B.W. Age - 8. Sex - Female.

Investigated as in-patient 1½ years ago. Bronchography showed definite tubular bronchiectasis at the left base. Radiogram normal. No atelectasis. No fibrosis.

History - Measles at the age of two; pertussis at age of three; Pneumonia at age of four; chronic cough and frequent attacks of acute bronchitis since. Tonsils and adenoids removed one year

ago. No history of haemoptysis or of aspiration of foreign body. No sputum. No dyspnoea.

Present Condition - Stated to be in perfect health except for a chronic cough and some "nervousness". Is top of class at school. A strong, well-nourished girl. Good colour. No clubbing. Height, 4 ft. 4 inches. Weight, 4 st. 1 lb. 4 ozs. No disease of nose or throat.

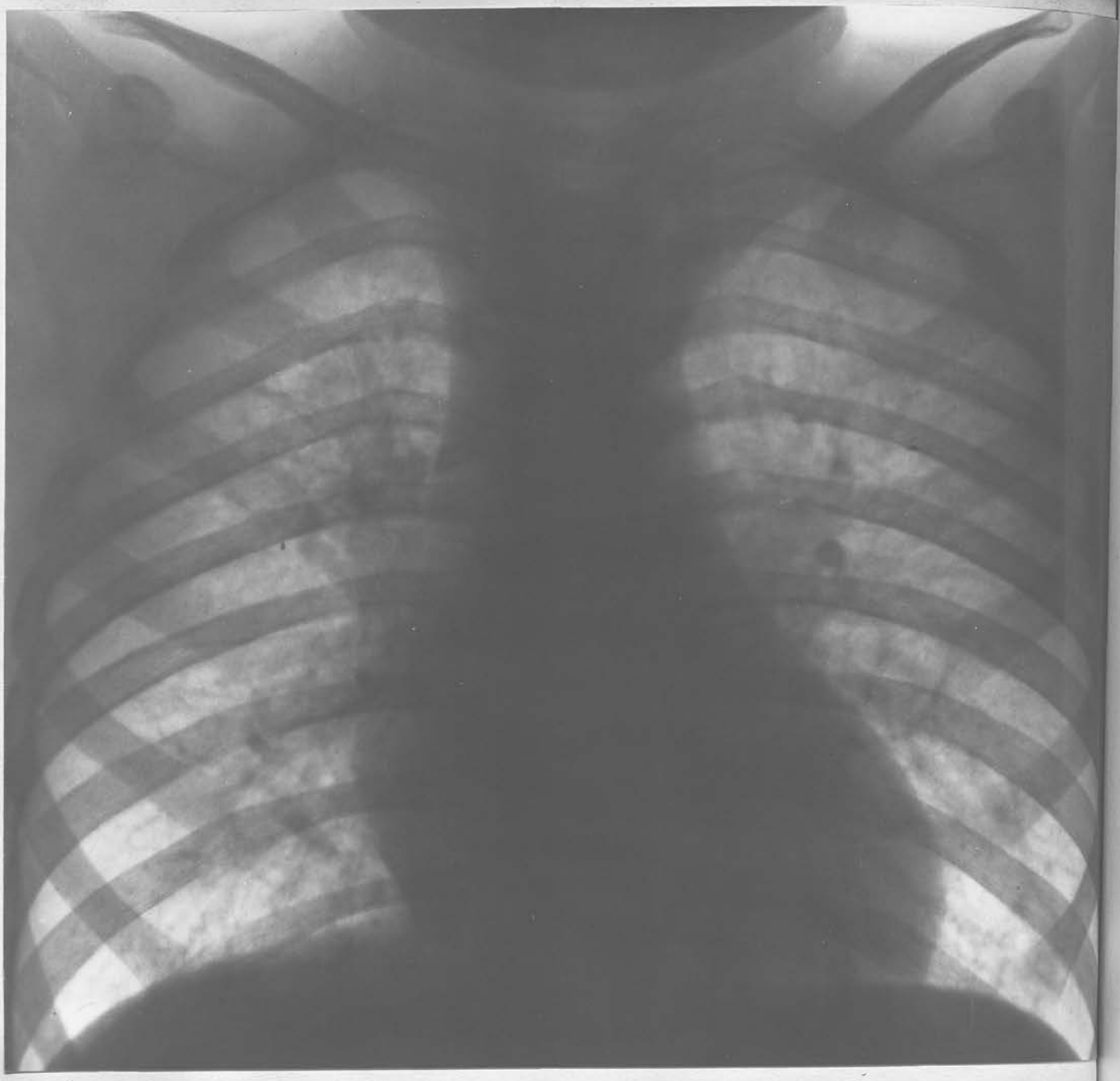
Chest - Well formed. Movements good and equal on both sides. Resonant percussion note. Vesicular breath sounds. No accompaniments.

Comments - This case was not investigated by the writer, but was seen 1½ years after bronchography. It is included in the series because it shows that a case of dry bronchiectasis may progress for years with scarcely any symptoms. This case is probably of four years' duration, since the cough originated in the attack of pneumonia, and there is definite proof that it is of 1½ years' duration, yet the child is in perfect health; the only symptom is cough; and there are no abnormal physical signs on chest.

She had not been attending as an out-patient as she did not consider this necessary, and a letter was sent requesting her to report for examination.

S U M M A R Y.

1.	Sex	Female.
2.	Age at observation	8 years.
3.	Probable age of onset	4 "
4.	Probable duration	4 "
5.	History of aspiration of foreign body ...	No.
6.	" " Measles	Yes.
7.	" " Pertussis	Yes.
8.	" " Bronchitis	Yes.
9.	" " Pneumonia	Yes.
10.	General condition	Good.
11.	Height	4 ft. 4 inches.
12.	Weight	4 st. 1 lb. 4 oz
13.	Upper air passages	Satisfactory.
14.	Haemoptysis	No.
15.	Clubbing	No.
16.	Dyspnoea	No.
17.	Cyanosis	No.
18.	Temperature	No.
19.	Physical signs on chest	Normal.
20.	Sputum	None.
21.	Spirochetes and fusiform bacilli	-
22.	Tubercle bacilli	-
23.	Other organisms	-
24.	Tuberculin tests	Not done.



CASE X. INCREASED DENSITY RIGHT HILUM AND BASE.
MEDIASTINUM SLIGHTLY DEVIATED TO RIGHT.

25. Radiogram ... ... Normal.

26. Atelectasis ... ... No.

27. Evidence of fibrosis ... ... No.

28. Toxic symptoms after bronchography ... ... None.

29. Distribution and site ... ... Left base.

30. Type .... Tubular.

31. Treatment ... ... None.

32. Prognosis ... ... Good.

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C A S E 10.

Name - C.H. Age - 5 Sex - Male.

Attended as out-patient for chronic cough. Refused to be admitted for investigation.

History - Severe attack of pneumonia at age 1½. Chronic cough ever since, recently productive of a small quantity of sputum in the mornings. Pneumonia three times since this first attack. Mumps, followed by bronchitis six months ago. Pertussis at the age of three. Never had measles. No haemoptysis. No dyspnoea. No history of aspiration of foreign body. No history of disease of, or operation on, nose or throat.

Examination - Well nourished, but flabby. No cyanosis. No clubbing. Height, 42 inches. Weight, 2 st. 8 lbs. Tonsils very large, but he is a nose breather.

Chest - Flattening and diminished movement on right side. Percussion note definitely impaired at right base. Vesicular breath sounds all over, but these are faint and more distant at the right base. Bubbling rales both bases but chiefly right.

X-Ray Chest - Some increase of density at the right hilum extending down to right base. Mediastinum somewhat deviated to right. Appearances suggest some fibrosis at the right base. No atelectasis.

Von Pirquet - negative.

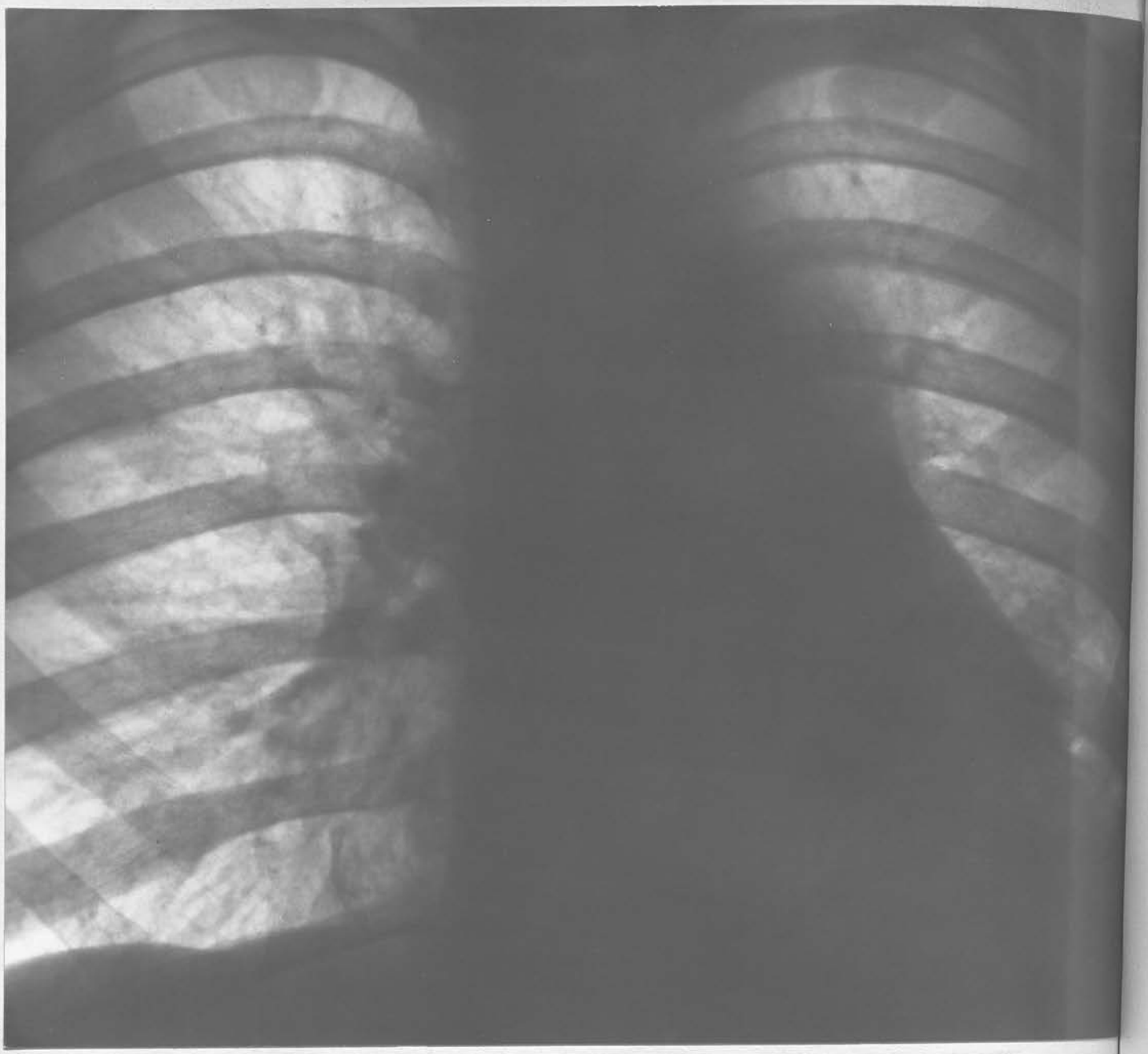
Sputum Report - No tubercle bacilli, spirochetes, or fusiform bacilli seen.

Organisms cultured were - (1) streptococcus (viridans and haemolyticus); (2) staphylococcus aureus; (3) diphtheroid bacillus.

S U M M A R Y.

1.	Sex	Male.
2.	Age at observation	5 years.
3.	Probable age of onset	1½ "
4.	Probable duration	3½ "
5.	History of aspiration of foreign body ...	No.
6.	" " Measles	No.
7.	" " Pertussis	Yes.
8.	" " Bronchitis	Yes.
9.	" " Pneumonia	Yes.

10.	General condition	Good.
11.	Height	42 inches.
12.	Weight	2 st. 8 lbs.
13.	Upper air passages	Satisfactory.
14.	Haemoptysis	No.
15.	Clubbing	No.
16.	Dyspnoea	No.
17.	Cyanosis	No.
18.	Temperature	No.
19.	Physical signs on chest	Abnormal.
20.	Sputum	Yes.
21.	Spirochetes and fusiform bacilli	No.
22.	Tubercle bacilli	No.
23.	Other organisms	Various.
24.	Tuberculin tests	Negative.
25.	Radiogram	Abnormal.
26.	Atelectasis	No.
27.	Evidence of fibrosis	Yes.
28.	Toxic symptoms after bronchography	-
29.	Distribution and site	? Right base.
30.	Type	?
31.	Treatment	Expectorants.
32.	Prognosis	Good.



CASE XI. MEDIASTINUM DEVIATED TO LEFT.

CONCLUSIONS.

Unfortunately, the parents refused to allow this boy to be admitted for investigation. A provisional diagnosis, however, of fibrosis with bronchiectasis, at the right base, was made from the clinical and radiological findings, viz :- he has a history of repeated attacks of pneumonia, and chronic cough since the first attack (i.e. it is of 3½ years' duration), and this is occasionally productive of sputum; the physical signs on the chest are suggestive of fibrosis with bronchiectasis at the right base, and this gains some support from the X-ray appearances.

The prognosis is fairly good, since there is no clubbing and only slight sputum. The patient is being kept under observation as an out-patient and treated with expectorant mixtures.

---oOo---

C A S E 11.

Name - K.H. Age - 7. Sex - Male.

Referred from Tuberculosis Dispensary (where he has been attending for one year) as case of bronchiectasis.

History - Pneumonia at age of two, followed by pertussis. Cough (unproductive) for six months after this. Pneumonia again at

age of five. No cough afterwards. Measles, followed by pneumonia, six months ago. Cough (unproductive) for one month afterwards. Cough then disappeared for a short period but has gradually recurred and is now occasionally productive of some sputum. No history of bronchitis. No history of disease of, or operation on, nose or throat. No haemoptysis. Dyspnoea on exertion.

Examination - Well nourished, but flabby. No cyanosis. Marked clubbing. Height and weight not obtained. No disease of nose or throat.

Chest - Marked retraction of left side of chest. Poor movement at both bases but especially left. Marked impairment of percussion note at left base. Vesicular breath sounds all over, but these are weak and faint at left base, and there are bubbling rales at left base.

X-ray Chest - Mediastinum markedly deviated to the left. Heart obscures most of left base but appearances are suggestive of fibrosis at the left base.

No further investigation was possible as the patient refused admission and did not report for further examination as an out-patient.

S U M M A R Y.

1.	Sex	Male.
2.	Age at observation	7 years.
3.	Probable age of onset	2 "
4.	Probable duration	5 "
5.	History of aspiration of foreign body ...	No.
6.	" " Measles	Yes.
7.	" " Pertussis	Yes.
8.	" " Bronchitis	No.
9.	" " Pneumonia	Yes.
10.	General condition	Good.
11.	Height	?
12.	Weight	?
13.	Upper air passages	Satisfactory.
14.	Haemoptysis	No.
15.	Clubbing	Yes.
16.	Dyspnoea	Yes.
17.	Cyanosis	No.
18.	Temperature	No.
19.	Physical signs on chest	Abnormal.
20.	Sputum	Yes.
21.	Spirochetes and fusiform bacilli	?
22.	Tubercle bacilli	?
23.	Other organisms	?

24.	Tuberculin tests	?
25.	Radiogram	Abnormal.
26.	Atelectasis	No.
27.	Evidence of fibrosis	Yes.
28.	Toxic symptoms after bronchography	--
29.	Distribution and site	?
30.	Type	?
31.	Treatment	Expectorants.
32.	Prognosis	Poor.

CONCLUSIONS.

It is unfortunate that it was not possible to investigate this case further. The physical signs on chest, supported by X-ray appearances, are conclusive of fibrosis at the left base. The fact that moist sounds are audible in the same region, and that there is a history of cough (although intermittent) which is now productive of sputum, is very suggestive that there is also bronchiectasis in the same region.

The origin was probably in the first attack of pneumonia, since there was a history of cough for six months after this, but it has evidently been a dry case and the cough has not been persistent till recently, when it has become productive and the case is, therefore, now a wet one.

In view of the fact that there is clubbing, dyspnoea and sputum, the prognosis is not good. Surgical treatment is

CASE XII. RADIOGRAM OF LUNG AFTER POST MORTEM INJECTION OF BARIUM. SHOWS THE CYSTS IN LEFT LUNG.

impossible since an accurate localisation of the disease is impossible without bronchography. The patient was given expectorant mixtures but failed to report for further treatment.

---oOo---

C A S E 12.

Name - J.B. Age - 10 months. Sex - Female.

(This case, being one of congenital bronchiectasis, will be described in detail).

Admitted - 4. 12. 34. Discharged - 18. 12. 34.

Re-Admitted - 2. 1. 35. Died - 14. 1. 35.

History - A first child. Father and mother well. Full-term child. Normal delivery. Birth weight not known. Breast fed for ten weeks, then various artificial foods, viz - "Ostomilk", "Cow and Gate", "Nestle", and finally cow's milk with "Blakey's Oatmeal".

Apparently a healthy child until age 6 months, when she had pneumonia. It was not known whether this was lobar or broncho-pneumonia, but the illness was severe and lasted ten days. A week later she developed pneumonia again. This time it lasted two weeks, and was again severe, but the type was not known. After this she had persistent cough and failed to gain weight satisfactorily. There were never any attacks of dyspnoea or cyanosis. She suffered from constipation and occasional vomiting.

Clinical Notes - Admitted to hospital at age of nine months for constipation and malnutrition. On admission - weight 11 lbs. 12 ozs. Pale, lethargic and undernourished. Coarse rhonchi all over chest but especially on left side, otherwise no abnormality.

Temperature 99° to 100° F. for a few days, but this later settled to 98° F. Crepitations often heard at the bases, especially on the left side. Cough persisted but the bowels moved normally and there was no vomiting. She gained weight slowly and was discharged a fortnight later, her weight then being 12 lbs. 9 ozs. Re-Admitted a fortnight later. Had lost 2 lbs. History of frequent loose brown stools commencing soon after discharge and persisting till re-admission. Temperature 101° F. on admission. Toxic and somewhat dehydrated. Crepitations all over chest but especially on the left side. No other abnormality.

For a few days she had one loose green stool daily and occasional vomiting, but the stools soon became normal and vomiting ceased. She had a persistent loose cough and the temperature fluctuated from 98° F. to 100° F. daily. The crepitations became louder and more bubbling in character, she became dyspnoeic and more cyanosed, and died twelve days after admission.

Autopsy Notes - A thin infant. Small shallow sore over sacrum. The right thorax - The right pleura and pleural cavity were normal. The right lung showed a few small areas of collapse but no pneumonia and no cysts.

CASE XII.

THE LEFT LUNG BEFORE SECTION.

CASE XII.

THE LEFT LUNG IN SECTION.

SHOWS THE CYSTS IN UPPER LOBE AND BRONCHO-PNEUMONIA IN LOWER LOBE.

The left thorax - The left lung was adherent to the chest wall and to the diaphragm, by tight fibrous adhesions. There was consolidation of most of the lower lobe but especially towards the base.

The upper lobe was divided into two: the upper part was normal; the lower part consisted of a number of thin walled vesicles of varying sizes, the maximum being about 1/3 inch in diameter.

The Heart - was normal.

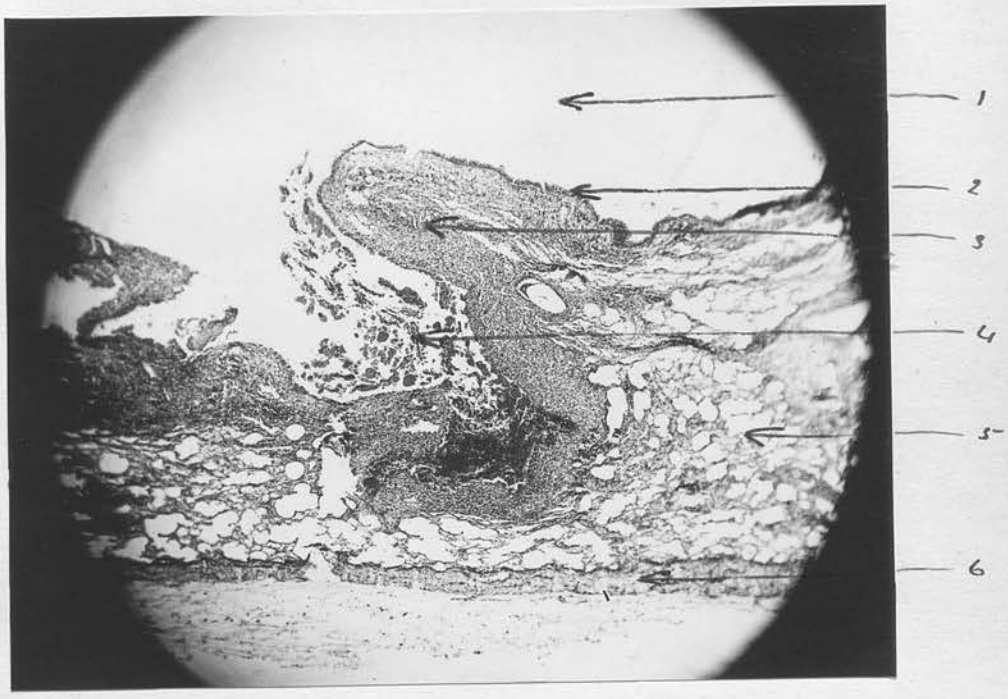
The Stomach, Intestines and other abdominal viscera were normal.

The Brain and Meninges were not examined.

Further Notes - Before the lungs were sectioned they were removed complete with the trachea, and a solution of barium sulphate (such as is used for a barium meal) was injected through the larynx by means of a Higginson syringe. An X-ray photograph was then taken which showed that the barium had entered and outlined the cysts. This photograph is shown at the end along with photographs of the left lung before and after section.

Pathology Report - The following is the report on the microscopical examination of the left lung.

1. Upper Lobe - "The 'cysts' are obviously dilated bronchi and for the most part lined by a layered bronchial-mucosa. In places the mucosa is missing and the 'cysts' are then lined by inflammatory granulation tissue, in which are numerous large cells having a markedly vacuolated cytoplasm and which appear



CASE XII. MICROSCOPIC APPEARANCE OF A CYST.

1 CAVITY OF CYST.
2 CILIATED EPITHELIUM OF CYST WALL.
3 GRANNULATION TISSUE.
4 INJECTION MATERIAL
5 ALVEOLI.
6 THICKENED PLEURA.

to be macrophages. Pus is present in some of the 'cysts' together with remnants of injection material. Alveoli are present but tend to be collapsed: some of them are lined by cubical epithelium suggesting that they were not functioning".

2. Lower Lobe - "Acute broncho-pneumonia with early fibrosis in parts".

3. Bronchial and Cervical Lymph Glands - "Oedema and hyperaemia. There are none of the giant cells described by Collins" (See Collins: "Journ. Path. & Bact.," 1933, xxxvii, 123.)

Comments - The term "Congenital Cystic Lung" is used (1) for cases in which occlusion cysts appear in the lungs, but which have no communication with the bronchi; (2) Congenital bronchiectasis, in which the dilated bronchi appear as cysts.

The condition is not common. Koontz[22], in 1925, collected 108 cases of congenital cystic lung (including many cases of congenital bronchiectasis) in the literature. He also describes a case of his own, of bronchiectasis in a child of twelve days, which obviously must have been congenital. A case of congenital cystic lung in an eight-months foetus, described by Sydney Smith, is quoted by Wood[50]. In this case, however, the cysts did not communicate with the bronchi. Wood describes a case of his own, of congenital bronchiectasis in an adolescent of 18, and Morlock and Pinchin[30] have seen several cases in young adults. Evidently, then, the cases may live for many years.

This case is one of congenital bronchiectasis because

(1) a radiogram after barium injection shows that the cysts communicate with the bronchi; (2) microscopical examination shows bronchial tissue in the cyst walls.

In view of the previous history of pneumonia, it might be suggested that this was an acquired case. Neither the naked eye, nor microscopical appearances, however, are those of acquired bronchiectasis, and it is more likely that the pneumonia aggravated the condition and caused clean cysts to become septic and infected.

The condition was not diagnosed till autopsy.

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CASES 13 to 20.

The following eight cases will not be described in detail. They are cases which were investigated by bronchography, but in which a diagnosis of bronchiectasis was excluded.

In none of the cases was a provisional diagnosis of bronchiectasis made, but in each case there was sufficient evidence to suggest the possibility of at least a latent bronchiectasis; because of this and owing to the fact that only by bronchography can bronchiectasis be excluded, these cases were investigated.

The reasons for suggesting the possibility of bronchiectasis in each case are given below :-

CASE XIII. NO BRONCHIECTASIS.

Case	Reason for Bronchography	
13	Persistent cough following measles.	Pertussis.
14	" " " pertussis.	Pneumonia.
15	" " " pneumonia.	Bronchitis,
16	" " " pleurisy.	Clubbing.
17	Chronic cough since birth.	Measles and pertussis.
18	Fibrosis of lung.	Measles and pneumonia.
19	Cough for one year with sputum.	Von Pirquet negative.
20	Pneumonia twice.	Measles and pertussis.

C A S E 13.

Name - E. Md. Age - 5. Sex - Female.

Attended as out-patient for cough of two months' duration following measles. Cough usually unproductive but occasionally slight sputum. Pertussis two years ago. Never had bronchitis or pneumonia.

No abnormal physical signs on chest.

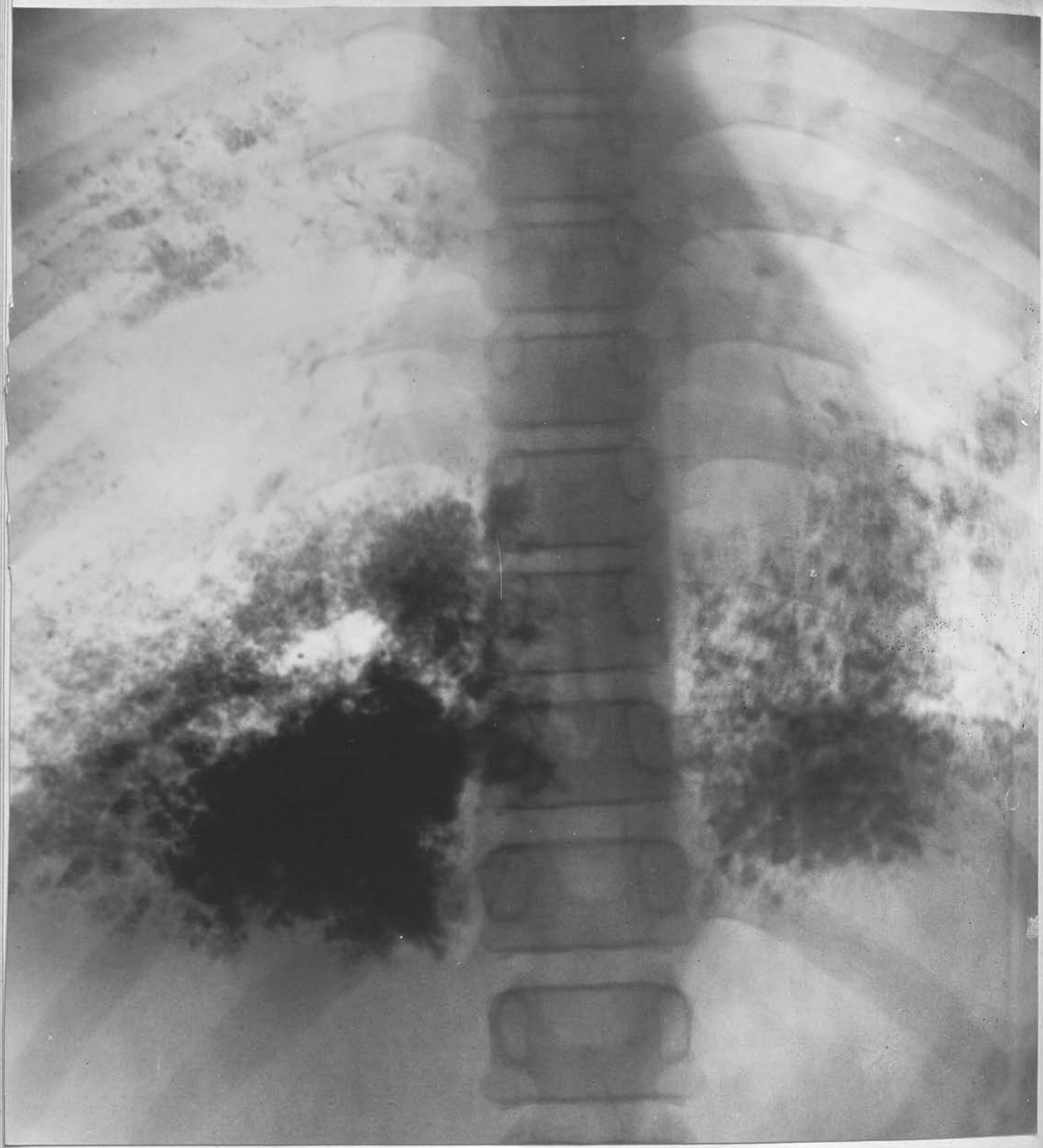
Admitted. 18 c.c. "Neo-Hydriol" given under general anaesthesia.

No evidence of bronchiectasis.

Notes - Measles is said to be an important aetiological factor in bronchiectasis. Probably this is only the case when there is some respiratory complication. In this case there was none, and no bronchiectasis was found.

It is interesting to note that in this case the cough disappeared entirely after "Neo-Hydriol" had been given.

CASE XIV. NO BRONCHIECTASIS.



CASE XV. NO BRONCHIECTASIS.

C A S E 14.

Name - B.P. Age - 4. Sex - Male.

Attended as out-patient for chronic cough since pertussis nine months ago. Cough occasionally productive. "Whoop" still present at times.

"Double pneumonia" at two. Attacks of acute bronchitis since. Measles in infancy.

No abnormal physical signs on chest. Von Pirquet negative.

X-Ray Chest - Slight increase in basal markings.

Admitted. 20 c.c. "Neo-Hydriol" given under general anaesthesia.

No evidence of bronchiectasis.

Notes - The history in this case was sufficient to suggest the possibility of bronchiectasis, but none was found. Probably the cough was due to a delay in clearing of the pertussis.

---oOo---

C A S E 15.

Name - R.P. Age - 5. Sex - Male.

Attended as out-patient for persistent cough since pneumonia three months ago. No sputum. Frequent attacks of bronchitis.

No measles or pertussis. No abnormal physical signs on chest.

X-Ray Chest - No abnormality seen.

Admitted. 20 c.c. "Neo-Hydriol" given under general anaesthesia.

No evidence of bronchiectasis.

CASE XVII. NO BRONCHIECTASIS.

CASE XVIII. NO BRONCHIECTASIS.

C A S E 17.

Name - M.C. Age - 7. Sex - Female.

Attended as out-patient for chronic cough since birth. No sputum. History of measles and pertussis. Never had bronchitis or pneumonia. A marked mouth breather. Tonsils very large. Von Pirquet positive. No abnormal signs on chest.

X-ray Chest - No abnormality seen. General condition good.

Admitted. 20 c.c. "Neo-Hydriol" given under local anaesthesia. No evidence of bronchiectasis.

Notes - This case shows that prolonged cough per se does not necessarily cause bronchiectasis, although, of course, it may be a factor. Possibly the cough in this case was due to enlarged tonsils and adenoids. There was no evidence of pulmonary tuberculosis, although the Von Pirquet was positive.

---oOo---

C A S E 18.

Name - E.B. Age - 10. Sex - Female.

Admitted for mild chorea. History of chronic cough of some years' duration. Measles in infancy. Pneumonia at five.

Chest - Impaired percussion and diminished air entry at left base.

X-ray Chest - Increased density left base suggesting chronic fibrosis. Von Pirquet negative.

Admitted - 20 c.c. "Neo-Hydriol" given under local anaesthesia. No evidence of bronchiectasis.

CASE IXX. NO BRONCHIECTASIS.

CASE ~~XX~~. NO BRONCHIECTASIS.

Notes - This case shows that fibrosis of the lung is not necessarily followed by bronchiectasis. When the two conditions co-exist probably the fibrosis is the secondary condition. In this case it was probably secondary to pneumonia.

---oOo---

C A S E 19.

Name - H.T. Age - 12. Sex - Male.

Attended as out-patient for debility. Chronic cough and occasional sputum for one year. Measles in infancy. Never had bronchitis or pneumonia.

Chest - Poor movement at both bases, otherwise no abnormality.

X-ray Chest - Increase in basal markings suggestive of chronic bronchitis.

Admitted - Von Pirquet negative. 20 c.c. "Neo-Hydriol" given under local anaesthesia. No evidence of bronchiectasis.

Notes - The cough and sputum in this case are probably due to chronic bronchitis. The negative Von Pirquet excludes tuberculosis and bronchography excludes bronchiectasis.

---oOo---

C A S E 20.

Name - G.W. Age - 10. Sex - Female.

Admitted for mild chorea. History of pneumonia twice. Also had measles and pertussis. Chronic unproductive cough for two years.

No abnormal physical signs on chest.

X-ray Chest - No abnormality seen.

Admitted - Von Pirquet negative. 20 c.c. "Neo-Hydriol" given under local anaesthesia. No evidence of bronchiectasis.

Notes - In this case the history leads one to suspect bronchiectasis, yet none was found, and the patient had had pneumonia twice.

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S E C T I O N III.

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GENERAL SUMMARY AND CONCLUSIONS.

In this Section the cases investigated in Section II will be considered as a whole, and the result of their investigation will be compared with the impressions gained from a survey of the literature as is given in Section I. Dogmatic conclusions have been avoided as far as possible owing to the small number of cases.

It should be pointed out that in all these cases the subjects were children. Bronchiectasis is not a disease limited to children, but it is more commonly seen in children, probably because a large percentage of cases arise in the acute respiratory diseases of infancy and early childhood, and many of these cases die before they reach adult life.

To summarise the investigation :-

1. 20 Children were investigated.
2. All had broncho~~scopy~~GRAPHY except three.
3. A diagnosis of bronchiectasis was made in twelve cases: in the remaining eight, bronchiectasis was excluded.
4. Of the twelve cases of bronchiectasis, one was a congenital case and eleven were acquired; and the acquired cases were all of the "primary" type.

5. A definite diagnosis was made in ten of the twelve cases and a provisional diagnosis in the other two.

Incidence of the Disease.

Twelve cases of bronchiectasis were collected during six months in a children's hospital which serves a city with a population of 500,000. This shows that the disease is by no means rare. McNeil[26] found eight cases of bronchiectasis in 1,000 general medical cases. Of the twelve cases discussed here, ten first attended the out-patient department of the hospital, and during the time they were collected 1,800 general medical cases attended for the first time, i.e. approximately six cases of bronchiectasis occurred in 1,000 general medical cases.

Bronchography has shown that latent cases can exist, and therefore that the disease is more common than is thought. Some of these cases illustrate this fact because in many of them even a provisional diagnosis could not have been made without bronchography (e.g. Case 9).

Sex Incidence. The disease is usually considered to affect the sexes about equally. In these twelve cases, seven were males and five females.

Age of Onset. As already stated, most cases of bronchiectasis originate in infency or early childhood. Excluding the case of congenital bronchiectasis, the estimated age of onset in each of the remaining eleven cases was as follows :-

Case Number	Estimated Age of Onset in Years.
1	3
2	1
3	3
4	3
5	5
6	½
7	2
8	7
9	4
10	1½
11	2
Total 11	32

i.e. the average age of onset is approximately 3 years, and nine had their origin under 5 years (c.f. Moll[29] - in 50% of 60 cases the disease began in the first five years of life).

It should be noted that these figures may not be accurate in every case, as the patient's history is not always reliable, but a very careful enquiry was made in each case before the age of onset was estimated.

Aetiology.

Of the twelve cases, one was congenital. The remaining eleven were acquired cases, and these are all of the "primary" type because in none of them was there a history of

aspiration of foreign body or any other evidence of bronchial obstruction.

Although called primary, by making a careful enquiry the origin in most cases could be traced to some antecedent pulmonary disease, i.e. the disease did not have an idiopathic origin. In many cases there was a history of more than one attack of acute respiratory disease; the onset was taken from the one at which cough or other symptoms developed.

The incidence of acute respiratory disease in each case was as follows :-

Cases	Measles	Pertussis	Bronchitis	Pneumonia
1	+	-	-	+
2	+	+	-	+
3	+	+	+	-
4	+	+	-	+
5	+	-	-	-
6	+	+	+	+
7	+	-	+	+
8	+	+	-	+
9	+	+	+	+
10	-	+	+	+
11	+	+	-	+
—	—	-	-	-
11	10	8	5	9

Although the incidence of measles and pertussis was high, these diseases must not be regarded as important causes per se because most children at the corresponding ages would probably have had these diseases. It is their complications, viz :- bronchitis and pneumonia, which are important. In only two cases was there no history of pneumonia, and in only one was there no history of either bronchitis or pneumonia (c.f. Findlay and Graham[16] - acute pulmonary disease in all but three of 23 cases). The most important point is that most cases not only gave a history of acute respiratory infection, but that their symptoms - e.g. cough - dated from this illness.

The causal illness was estimated as follows :-

Case No.	Probable Cause
1	Pneumonia
2	"
3	Bronchitis (after measles)
4	Pneumonia
5	Measles
6	Pneumonia
7	" (after measles)
8	"
9	"
10	"
11	" (followed by pertussis)

Thus, in nine out of the eleven cases, the onset was traced to pneumonia. In Case 3 it was traced to bronchitis, and in Case 5 to measles. This is strong evidence of the importance of respiratory disease in the aetiology.

As already stated, McNeil, Macgregor and Alexander[28], have pointed out that destruction of the bronchial wall, such as occurs in bronchitis and broncho-pneumonia (but not in alveolar pneumonia), is almost a sine qua non in bronchiectasis. In these twelve cases no attempt was made to ascertain whether the pneumonia was a broncho-pneumonia or alveolar pneumonia, because it was felt that the patient's statements could not be relied on for accuracy regarding this.

Not every case of acute bronchitis or pneumonia is, however, followed by bronchiectasis. In the eight cases in which no bronchiectasis was found it will be seen that there is a history of pneumonia in three and bronchitis in one. Probably it is only when these conditions are severe enough to cause destruction of the bronchial wall that it ensues. No accurate judgment of the severity of these illnesses could be made from the patients' statements.

Atelectasis. Another factor which may decide whether a case of bronchitis or pneumonia develops bronchiectasis is atelectasis. There was no evidence of atelectasis in any of these cases at the time of observation, yet it is possible that there may have been at the time of the acute illness.

Disease of the Upper Air Passages is supposed to play a part in the aetiology of the condition. In only one of these cases (Case 4) was this the case, and here it probably only played an indirect part in that it pre-disposed to pneumonia.

Increased Intra-Bronchial Pressure. The importance of this in the aetiology is probably over-estimated. Thus, in four of the cases with no bronchiectasis, there was a history of pertussis, and this is a condition in which there is spasmodic coughing such as would raise the intra-bronchial pressure. Probably it is only when the bronchi are diseased that it can have any effect.

Fibrosis and thickened Pleura. At one time these conditions were supposed to be the most important causes of bronchiectasis. In only three of these cases, however, was there any definite evidence of fibrosis, and these three cases were advanced cases, and therefore, the fibrosis was probably secondary. Moreover, in Case 18 there was definite evidence of fibrosis, yet no bronchiectasis. This suggests that fibrosis is of no importance in the aetiology of bronchiectasis.

Again, in Case 16 there was evidence of chronic pleurisy, and yet no bronchiectasis, and therefore this condition does not necessarily cause bronchiectasis.

Summary of Conclusions regarding Aetiology. From these findings one is driven to the conclusion that the so-called primary or idiopathic (these are bad terms) form of bronchiectasis is due to

an acute respiratory disease of such a nature and severity as will produce destruction of the bronchial wall.

Pathology.

There is general agreement that the disease is more often unilateral than bilateral, but figures vary. In these twelve cases only one (Case 2) was bilateral. Most of the cases, however, were not advanced cases, and it is in the advanced cases that bilateral disease is more common. Moll[29] gives figures as follows :-

	55 Post-Mortems	37 Lipiodols
Unilateral ...	50·9%	67·5%
Bilateral ...	49·1%	32·5%

Site. In all these twelve cases the disease was in the lower lobes. It is not common in the upper lobes (Moll says 13% occur in the upper lobes). All observers agree that it is more common in the left lower lobe than in the right lower lobe. In these eleven cases the site was ascertained in nine cases: in one it was bilateral, in the remaining eight it was at the left base. In one of the two cases in which a provisional diagnosis was made, the disease was probably at the right base, and in the other, at the left.

Types. The various types probably occur in about equal proportions. In this series they were as follows :-

Tubular ...	4
Saccular ...	3
Fusiform ...	2

The type, however, was not always definite, and many of the cases were intermediate between two types.

Clinical Features.

It has already been shown that there was a history of bronchitis or pneumonia in all of these cases (except one, in which there was only a history of measles). An important point is, that not only is there a history of these conditions, but that they are often found to have recurred frequently.

The General Condition. It is not until the condition is advanced that there is any marked deterioration in the general condition. All the cases observed in this series were in comparatively good health, except Case 2, where the condition was more advanced.

Findlay and Graham[16], in their series of 23 cases in children, compared the heights and weights with those from Holt's tables. They found that on an average their cases were considerably under height, but only slightly under weight.

In the twelve cases under consideration here, the height and weight was obtained in ten. These heights and weights are compared with those for the same ages given (1) by Holt; (2) by McNeil (in his Edinburgh lectures to students); (3) by a table published by Messrs. Burroughs and Wellcome.

WEIGHTS IN POUNDS.

Case No.	Sex	Age	Weight	Holt	McNeil	B. & W.
1	M	12	77	77	78	76
2	M	6	38	48	44	44
3	F	6	40	46	44	42
4	F	7	38	42	48	47
5	F	14	76	over 88	?90	96
6	M	5	31	36	40	40
7	M	5	40	47	40	40
8	M	8	58	61	54	55
9	F	8	57	64	54	52
10	M	5	36	39	40	40

HEIGHTS IN INCHES.

Case No.	Sex	Age	Height	Holt	McNeil	B. & W.
1	M	12	56	56	55	55
2	M	6	46	41	43	43
3	F	6	45½	42½	43	42
4	F	7	44	41½	45	44
5	F	14	58½	?57	?59	60
6	M	5	40	under 38	41	40
7	M	5	46½	42½	41	40
8	M	8	51	50	47	47
9	F	8	52	50	47	46
10	M	5	42	40	41	40

Summary of Tables.

A. Weight :-

1. According to Holt, 1 case is of average weight and 9 are under weight.

2. According to McNeil, 1 case is of average weight, 2 are over weight, and 7 are under weight.

3. According to tables of Messrs. Burrows and Wellcome, 1 case is of average weight, 3 are over weight, and 6 are under weight.

B. Height :-

1. According to Holt, 1 case is of average height, and 9 are over the average height.

2. According to McNeil, 3 cases are under height and 7 are over height.

3. According to tables of Messrs. Burrows and Wellcome, 2 are of average height, 1 is under height and 7 are over height.

Comments. From these figures it can be seen that the majority of the cases were under weight and over height. This differs from the findings of Findlay and Graham[16] as their cases tended to be considerably under height but little under weight.

Other Symptoms.

1. Cough. This is one of the most important symptoms. It was present in all the cases. (c.f. Wall and Hoyle[47] - cough in all but three of twenty cases, and Findlay and Graham[16] - cough in 22 out of 23 cases).

2. Sputum. Of the eleven acquired cases only five had definite sputum, and in none of these cases was it profuse, or purulent and offensive. Of the remaining six cases, some occasionally had slight sputum (e.g. after lipiodol or drainage), while others never had any. Case 9 is the best example of a case of dry bronchiectasis, as there was no sputum at any time, and yet the bronchogram showed well developed bronchiectasis.

The sputum was examined in six cases. No tubercle bacilli, spirochetes, or fusiform bacilli were found in any specimen. The organisms found varied in each case, and there was nothing characteristic about them.

3. Haemoptysis. This was only found in one case, and it was not a profuse haemoptysis.

4. Dyspnoea was present in three of the eleven cases.

5. Cyanosis. Only one case had slight cyanosis.

6. Finger Clubbing. In four cases there was definite finger clubbing, and in two slight finger clubbing, while the other five had none.

Physical Signs. In six cases there were abnormal physical signs on the chest. In some of the remaining cases crepitations were

sometimes heard over the affected part, while at other times the chest was normal. There were no physical signs of cavitation in any case and the abnormal signs mostly consisted of impaired percussion and accompaniments. Bilateral signs were often found in unilateral cases.

Only three cases showed evidence of fibrosis either by physical signs or X-ray.

N.B. Wall and Hoyle[47] found abnormal physical signs in all but two of twenty cases.

Summary of Clinical Features. The chief feature is cough, which usually dates from an acute respiratory illness. Later, sputum and clubbing are common. Haemoptysis, dyspnoea and cyanosis are not common symptoms. There may be no abnormal physical signs and the radiogram may be normal. Abnormal physical signs usually consist of impaired resonance and crepitations.

Diagnosis.

In most of these cases, even a provisional diagnosis could not be made without bronchography, and even if a diagnosis was made it was often impossible to locate the side on which the disease was, without lipiodol. In four cases the distribution was correctly diagnosed without lipiodol. In five cases (Cases 5 - 9) it was impossible to estimate the distribution without lipiodol. (c.f. Wall and Hoyle[47] - site accurately diagnosed without lipiodol in 17 of 20 cases).

Even a plain radiogram cannot be relied on for a diagnosis. A plain X-ray was taken in ten cases, but in only five of these did it show any abnormality. In some, these abnormal appearances consisted merely of increased density in the affected part, while in others there was definite evidence of fibrosis.

In ten cases a Von Pirquet reaction was done to exclude tuberculosis. It was negative in every case but one, and in this case there was no clinical or radiological evidence of tuberculosis.

To sum up - A history of chronic cough following an acute respiratory illness should always arouse the suspicion of bronchiectasis. If there is finger clubbing and sputum, the suspicion becomes stronger, and if there is also a localised area of impaired resonance with moist sounds at one base, a provisional diagnosis may be made, if tuberculosis can be excluded. To make an accurate diagnosis, however, bronchography is necessary . It is a safe procedure. In 17 cases investigated in this way, only one had slight toxic symptoms.after lipiodol or "Neo-Hydriol" (viz. vomiting for 24 hours), and one developed sub-cutaneous emphysema.

Prognosis and Course.

In Case 2 the prognosis is poor because the condition is bilateral and advanced, sputum and clubbing are marked, and the general condition is not good. In the other cases it is fairly

good, a guarded prognosis being given in those cases with clubbing or definite sputum (e.g. Cases 1 and 3).

It is not likely that any of these cases are of the "acute" type in which recovery is possible, and it should be pointed out that by giving a good prognosis one is estimating that there will possibly be some years of comparatively healthy life, at the same time regarding the condition as being progressive.

The course of the disease is difficult to estimate, especially since the observations on these cases have been made over a limited period. Its duration has been estimated as follows :

Case No.	Probable Duration in Years.
1	9
2	5
3	3
4	4
5	9
6	$4\frac{1}{2}$
7	3
8	1
9	4
10	$3\frac{1}{2}$
11	5
11	51

i.e. the average duration at the time of observation is nearly five years, and in two it was nine years.

Of course, it is impossible to be dogmatic about these figures, but they were estimated after a very thorough enquiry into the history.

Case 9 is interesting because it shows definite evidence of the disease having existed for 1½ years, yet the only symptom is cough, and there is no clinical or other evidence of the presence of disease.

Opinion, in general, is very divided regarding the prognosis and course, although most agree that it is progressive. From these observations the opinion formed is that the disease is slowly progressive and that the prognosis should generally be guarded. Evidently the rate of progress may vary considerably, e.g. in Case 5 the disease was probably of 9 years' duration, and yet the prognosis is good, while in Case 3 it was only of 3 years' duration and yet the prognosis was not nearly so good.

Treatment.

Many of these cases (e.g. Cases 6 - 9) required no treatment meantime, but it is necessary that they should be kept under observation. Those requiring treatment were treated by medical methods, e.g. expectorant mixtures and postural drainage. Some of these (e.g. Cases 1, 3 and 4) were suitable cases for lobectomy in view of the fact that the condition was well developed and unilateral, and yet the general condition was good. Facilities for this operation were not available at the time, but arrangements are now under consideration. Other surgical procedures (collapse

therapy) were not considered justifiable in that it was considered that they were merely palliatives and that equally good palliative treatment could be obtained by medical methods.

In Conclusion, to quote Graham Bryce ("Brit. Med. Journ.", 1935, I, 353) :-

"I hope, however, that enough has been said to show that the day of helpless inactivity is past, and that it is possible to restore to health and self-respect not a few of those who are afflicted by a condition which is crippling, frequently lethal, and all too often repulsive, not only to those with whom they come in contact, but to the unfortunate sufferers themselves".

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CONCLUSIONS SUMMARISED.

1. Bronchiectasis is not an uncommon disease in children.
2. It affects males and females equally.
3. Most cases arise in the acute respiratory diseases of infancy or early childhood.
4. A congenital form exists, but most cases are acquired.
5. The acquired cases may be secondary to bronchial obstruction, but most are the result of bronchial destruction.
6. Factors other than bronchial destruction are unimportant in the aetiology.
7. The disease is more commonly unilateral than bilateral.
8. It affects the base more often than the apex, and the left base more often than the right base.
9. The general health is good, except in the late stages. The chief feature is cough (chronic) dating from an acute respiratory illness and followed later by sputum and clubbing Abnormal physical signs, when present, chiefly consist of impaired percussion and accompaniments.
10. Bronchography is essential for a diagnosis and it is safe. A plain X-ray is unreliable and abnormal physical signs may be absent. Pulmonary tuberculosis should be excluded.
11. The disease is slowly progressive. Prognosis should be guarded.
12. Lobectomy is the ideal treatment. Other forms of treatment are only palliative, and of these, medical methods are to be preferred to surgical.

B I B L I O G R A P H Y.

1. Anspach: "Amer. Journ. Dis. Child.", 1934, XLVII, 1011.

2. Beaumont: "Textbook of Medicine", Lond., 1932, p. 122.

3. Beaumont and Dodds: "Recent Advances in Medicine", p. 305.

4. Bezancon and Azoulay: "Presse Med., Paris", 1924, XXXII, 157. (Quoted by Moll).

5. Boyd: "Pathology of Internal Diseases", 1931, p. 186.

6. Carmichael: "Canad. Med. Assoc. Journ.", 1932, XXVI, 319. (Quoted by Scadding).

7. Chandler: "Lancet", 1934, II, 943.

8. Clark, Hadley and Chaplin: "Fibroid Disease of Lung and Pleura", Lond., 1891. (Quoted by McNeil, Macgregor and Alexander).

9. Collins: "Journ. Path. and Bact.", 1933, XXXVII, 123.

10. Corrigan: "Dublin Med. Journ.", 1838, XIII, 266. (Quoted by McNeil, Macgregor and Alexander).

11. Crocket: "Physiological and Radiological Examination of the Lungs", p. 228.

12. Delille: "Rev. franc. de ped.", Paris, 1925, I, 125.

13. Fenton: "Brompton Hosp. Reports", 1932, I, 123. Also in "Lancet", July 17th, 1931.

14. Findlay: "Lancet", 1927, I, 1027.

15. Findlay and Delille: "Lancet", 1927, I, 1027.

16. Findlay and Graham: "Arch. Dis. Child.", 1927, II, 71.

17. Findlay and Graham: Ibid., Feb., 1931, p. 1.

18. Fox: "Diseases of Lung and Pleura", 1891. (Quoted by Moll).

19. Hedblom: "Journ. Amer. Med. Assoc.", 1927, lxxxix, 1384. (Quoted by Moll).

20. James: "Brit. Journ. Surg.", 1933, XXI, 257.

21. Kerley: "Recent Advances in Radiology".

22. Koontz: "Bullet. John Hopkins Hosp.", 1925, XXXVII, 340.

23. Laennec: "Treatise on Diseases of the Chest and on Mediate Auscultation", (Quoted by McNeil, Macgregor and Alexander).

24. Lloyd: "Brit. Med. Journ.", 1935, I, 165.

25. Mason: "Brit. Med. Journ.", 1935, I, 299.

26. McNeil: "Brit. Med. Journ.", 1932, II, 229.

27. McNeil, Macgregor and Alexander: "Arch. Dis. Child.", April, 1929, p. 83.

28. McNeil, Macgregor and Alexander: Ibid., Aug. 1929, p. 170.

29. Moll: "Quart. Journ. Med.", 1932, July, p. 457.

30. Morlock and Pinchin: "Brit. Med. Journ.", 1933, II, 780.

31. Nelson: "Brit. Med. Journ.", 1934, I, 58.

32. Oakley: "Brit. Med. Journ.", 1931, II, 378.

33. Oschner: "Amer. Journ. Med. Sci.", 1930, clxxix, 388, (Quoted by Moll).

34. Osler: "Textbook of Medicine", p. 627.

35. Parsons and Barling: "Diseases of Infancy and Childhood", p. 959.

36. Pearson and Wyllie: "Recent Advances in Diseases of Children".

37. Pinchin and Morlock: "Brit. Med. Journ.", 1930, I, 12.

38. Pinchin and Morlock: "Brit. Med. Journ.", 1930, II, 315.

39. Pinchin and Morlock: "Brit. Med. Journ.", April 9th, 1932.

40. Riviere: "St. Bart.'s Hosp. Reports", Lond., 1905, XLI, 123. (Quoted by McNeil, Macgregor and Alexander).

41. Roberts and Nelson: "Brit. Journ. Surg.", 1933, XXI, 257.

42. Robinson: "Brit. Journ. Surg.", 1933, XXI, 302.

43. Roles and Todd: "Brompton Hosp, Reports", Vol. II, 1933.
Also in "Brit. Med. Journ.", Oct. 7th, 1933.

44. Scadding: "Brit. Med. Journ.", 1934, II, 1147.

45. Siccard and Forestier: "The Use of Lipiodol in Diagnosis and Treatment", 1932.

46. Taylor: "Practice of Medicine", Ed. by Poulton, 1930, p. 219.

47. Wall and Hoyle: "Brompton Hosp. Reports", Vol. II, 1933, p. 118.
Also in "Brit. Med. Journ.", April 8th, 1933.

48. Warner: "Quart. Journ. Med.", July 1934, p. 401.

49. Wood, H.G.: "Journ. Amer. Med. Assoc.", 1934, CIII, 815.

50. Wood, W.B.: "Tubercle", 1934, XVI, 49.

51. Bryce, Graham: "Brit. Med. Journ.", 1935, I, 350.

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